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ABSTRACT

Examined in this document are the different ways in which the age a woman has her first child might affect her later well-being. Specific questions addressed include: (1) How do teenage mothers compare later in life with young women who postpone their first birth to their early twenties? and (2) If they are less well off, what explanation can researchers provide as to the process? Data from two surveys, the National Longitudinal Survey of Young Women and the Michigan Panel Study of Income Dynamics, are used in the analysis. Of the variables available in the two data sets, this study examines race, age, parental socioeconomic status, number of siblings, whether the oldest child, urban or farm background, a foreign-born parent, southern background, religious affiliation (Catholic), and whether or not the respondent grew up with both natural parents, as possible determinants of both age at first birth and age at first marriage. Other factors considered include income, education, and labor force experience. Findings presented indicate that the age at which a woman bears her first child can contribute or detract from her well-being at a much later stage, but that this process does not have to be inevitable. (Author/EB)

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THE CONSEQUENCES OF AGE AT FIRST CHILDBIRTH: CAUSAL MODELS

by

Sandra L. Hofferth and Kristin A. Moore

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THE CONSEQUENCES OF AGE AT FIRST CHILDBIRTH: CAUSAL MODELS

INTRODUCTION

The widespread conviction that early childbearing precipitates a number of social and economic problems is founded on surprisingly little evidence. Many associations between teenage pregnancy and lower social and economic attainment have been reported, but the causal role of the occurrence of an early birth has not been established. Researchers have tended to study small groups of girls, typically at only one point in time, and without controlling for important background variables that might affect later status attainment. The possibility that young women who bear children at an early age differ from their childless age peers in numerous ways is often ignored or only mentioned in passing. Therefore, it is not clear whether it is really the early birth or some other antecedent factor that accounts for the social and economic difficulties so often noted among teenage mothers. Furthermore, we lack understanding of the process by which early childbearing might affect attainment. If early childbearing is found to be associated with lower social and economic status after important social, demographic, and motivational variables are controlled, it is necessary to discover the process by which an early birth exerts such a negative impact.

Some of the more sensitive studies that have been done have made it clear that the process is not straightforward or easy to untangle. For example, Furstenberg (1976) studied a group of pregnant teenagers over a period of five years, comparing them with their high school classmates, some of whom also became premaritally pregnant, some of whom did not, but all of whom were black and relatively disadvantaged. He reports that "their life situations

some five years after the birth of their first child reflect a broad range of advantages and hardships which seem to defy a simple accounting scheme... proving how erroneous some of our impressions of early parenthood have been; in particular, the notion that bearing an unplanned child in adolescence leads inevitably to a life of deprivation" (Furstenberg, 1976:xvi). What, then, is the effect of an early birth -- net of social, motivational and demographic factors -- on later attainment? Specifically, how do teenage mothers compare later in life with young women who postpone their first birth to their early twenties? If they are less well off, what explanation can researchers provide as to the process? These are the questions addressed in this study of a large, national sample of contemporary young women.

Disadvantages Associated with Early Childbearing

Educators, parents, and policy-makers are concerned that premature pregnancy disrupts and accelerates the life course of the adolescent, pre-empting the educational, vocational, and social experiences of the teens and early twenties that are so important to later social and economic well-being. As Bacon (1974: p. 333) notes, "any important life event is potentially stress-inducing as one abandons and adopts meaningful social roles . . . If motherhood occurs very early in life, it is probable that a stress-engendering acceleration of role transitions will lead to . . . social pathologies".

The young mother's first priority must be to secure some means of support for herself and her child, a necessity which could propel her into an unhappy marriage, a low-paying, dead-end job, or onto welfare. Evidence (e.g., Bumpass, et al., 1977; Moore and Hofferth, 1978; Trussell and Menken, 1978) also indicates an association between an early first birth and higher subsequent fertility, suggesting that the young mother may soon find herself with several children to care for. Other evidence suggest that the early

childbearer completes considerably less schooling than her later bearing sisters (Furstenberg, 1976; Waite and Moore, 1978; Moore, et al., 1978), placing her at a disadvantage on the job market as well as limiting her opportunity for personal and intellectual growth. If she marries, her husband is also likely to be relatively young and unskilled, so family income is likely to be low (Coombs, et al., 1970).

Furthermore, early childbearing pushes a young woman into a role for which she is likely to be only casually prepared. Parenthood is a demanding role even when assumed at an older age (Rossi, 1968). By moving into this role so early, the young woman is immediately set apart from her peers and perhaps estranged from her family as well. Therefore, she may have trouble maintaining a supportive network at a time when her needs for emotional and physical assistance may be especially great.

However, despite the surface plausibility of such arguments, it is also possible that teenagers who bear children differ initially from their later bearing peers; in this case, the occurrence of a birth would only be correlated with later difficulties (or a compounding factor in such difficulties), but not the cause of such problems. Both early pregnancy and eventual poverty might be due instead to lesser motivation, to lack of interest in achievement, or to a set of beliefs and values which in themselves lead to lower attainment, regardless of pregnancy.

Are There Possible Advantages to Early Childbearing?

Possible advantages to teenage childbearing should also be considered. Early childbearers may find it possible to "get over with" the childbearing stage and move fairly early into permanent or steady labor force participation, thus contributing to household income and gaining valuable work experience. Young fathers may not obtain as much schooling; but the payoff to a college

degree has been questioned of late, given the over-supply of well-educated young workers and the high wages paid in many blue collar jobs. Husbands in blue collar occupations tend to make top wages in their mid-twenties (Oppenheimer, 1974). In addition, among males, work experience has been found to be associated with higher wages among both males (Featherman and Hauser, 1976) and females (Mincer and Polachek, 1974; Hofferth, et al., 1978). Job seniority may reduce the likelihood of unemployment for both men and women. In addition, working mothers will not be faced with the problems of interrupting work to have a family or of locating child care for pre-schoolers, as they might if they worked before forming a family, so continuing full-time employment might be more feasible. Finally, although early marriage has been linked to a higher probability of divorce or separation (Bumpass and Sweet, 1972; Norton and Glick, 1976), those couples who remain married may accumulate considerable assets before their peers are even out of school.

Given these possible advantages, it does not seem wise to assume that all of the consequences of early childbearing are negative. Rather, researchers should attempt to sort out positive from negative consequences.

MODEL DEVELOPMENT AND LITERATURE REVIEW

The Effect of Early Childbearing on Later Economic Well-Being: A Causal Model

We have discussed a number of different ways in which the age a woman has her first birth might affect her later well-being. To estimate the various sizes of these effects and their over-all impact on young women, we have developed a causal or path model.[1] This technique enables us to examine indirect as well as direct effects. This is important because even if age at first birth does not directly affect later well-being, it may do so indirectly, through its effects on educational attainment, on total family size, or on labor force participation. Each of these effects will be calculated separately and then combined into an estimate of the total effect on the well-being of a young woman.

The components of household income--the respondent's income and the income of other family members--were chosen as our measures of well-being not only because income affects the food, housing, leisure, medical care, and social status of all household members, but also because poverty places a burden on society as a whole when welfare support is necessary. In addition, household income provides a straightforward and clearcut measure of well-being.

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1. Path analysis is a method for tracing the implications of causal orderings of variables. By causality is meant (1) concomitant variation and (2) temporal ordering, such that a change in one variable is followed (in time) by a change in another. Striking a match is, for example, causally associated with production of fire, and striking must precede fire in time. Although we can detect and measure co-variation we often must assume temporal ordering, as in trying to decide whether having a first birth precedes dropping out of school or vice versa. It is likely that the ordering depends on age: for the youngest females who are still in school, the effect proceeds from birth to quitting; for older women it is the other way.

Path Coeffients are obtained by regressing each dependent variable on only those independent variables that are believed to be direct causes. In the diagram, paths are represented by the arrow passing directly from one variable to the next with no variable intervening. The origin is called the independent variable, the variable to which the arrow points is called the dependent variable.

In Figure 1, we have diagrammed the factors that we hypothesize to affect the components of household income, their causal direction, and their temporal order. We have no reason to expect that the age at which a woman has her first birth will directly affect her later income. However, it may do so indirectly by affecting the amount of education she receives, her total family size, her labor force participation, or the income contributed by other household members. The woman's own income and poverty status are the only completely endogenous variables in the model. Several exogenous variables are available to include as controls for social, motivational, and demographic influences on variables in the model.

Parental socioeconomic level and race have been consistently shown to play an important role in determining later socioeconomic attainment (see, for example, Blau and Duncan, 1967; Duncan, Featherman and Duncan, 1972; Sewell and Shah, 1967, 1968; Featherman and Hauser, 1976; Treiman and Hauser,

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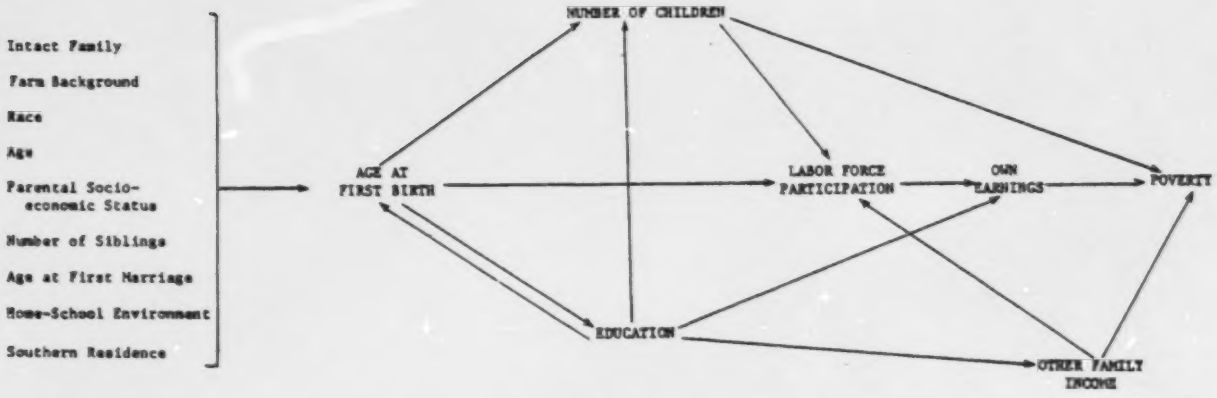
Each coefficient (the "b") in a regression represents the effect on the dependent variable of changing the causal variable by one unit. For example, raising the age at which a woman bears a child by one year will increase the number of years of schooling she completes by one-third of a year. In a path diagram the coefficients used are standardized (adjusted for the differing dispersions of the variables around their means) so that what we read in each coefficient on the path diagram is the standardized change in the dependent variable expected for each standard unit change in the independent variable. (Both standardized and unstandardized (metric) coefficients are presented in the tables.)

Using the standard coefficients we can analyze the effect of a change of one standard unit in a variable at the beginning of any causal chain on each variable in that chain, until it reaches the end. This analysis of paths (or "path analysis") is useful to trace the ultimate implications of intervening at some point in the chain.

Using the diagrams in this paper, the reader can begin at any point and trace the effects along any single path, for example, from age of a woman at her first birth to her own income, by multiplying successive coefficients. The sum of the effects (paths) that pass through a single variable is called the indirect effect through that variable. The sum of effects over all paths from age at first birth to own earnings is the total effect of age at first birth on her income. The path passing directly from age at first birth to her own earnings, without passing through any other variables, is called the "direct" effect. (For further discussion of path analytic procedures, see Heise, 1975, and Duncan, 1975).

Figure 1

Schematic Diagram of the Effects of Age at First Birth on Socioeconomic Wellbeing



1975) and, we hypothesize, will also be important in determining age at first birth.

In the NLS analysis, all women are 27. Age in 1968 is, therefore, a proxy for birth cohort of the woman, which has been shown to be an important determinant of fertility (Glick and Norton, 1977), employment status (Farkas, 1977), and, therefore, we hypothesize, her income. In the PSID analysis, women are of differing ages. Therefore, age in 1976 is an indicator of both aging and cohort effects. We have controlled in each equation for parental socioeconomic level, race, and age. The remaining predetermined variables serve first, as specifiers of the model, reducing the possibility of correlated distrubances, and second, in the case of the relationship between age at first birth and education, as instruments to a non-recursive relationship.

Going from right to left in Figure 1, we will now explicate the path model.

Poverty is by definition (See Appendix Table 1) a function of the income available to the household and of the number of people dependent upon that income. Household income is measured separately as the income of the woman

and as the income of others in the household, while the number of children measures the burden of dependency in these families.

The woman's own income is a function of the number of hours that she works and her hourly earnings. We have not included a measure of her hourly wage. In the NLS, hourly wages were measured at the time of the survey when only 38 percent of the women were employed (whereas 65% had worked some hours in the previous year and, therefore, reported some income during that period). In the PSID, average hourly wage was not obtained independently of annual earnings and hours; therefore, it would not be appropriate to include it. The income of other household members may also affect the woman's income. Those who are not married or have no other source of income will have a greater need to maximize their own earnings. Finally, past labor force participation is a predictor of a woman's wages and annual earnings. We have a measure of total labor force experience for the PSID women, though not for the NLS women.

Other family income consists primarily of the income of the husband, though other relatives might also contribute, especially if the woman is not married. Since the husband earns most of the income in the vast majority of American households (Glick and Norton, 1977), this variable is expected to be the primary determinant of poverty. It has been separated from the woman's income so that influences on each can be examined independently. Determinants of the income of other adults in the household that are of interest in this analysis include a woman's age at first birth and her educational attainment. Our expectation is that early childbearers and women who themselves complete less education are likely to find their marriage prospects limited to men of lower earning ability. Since very little is known about the characteristics of these other household members, the residual for this variable is expected to be large.

A woman's labor force participation has been found to be a function of husband's income (see, for example, Bowen and Finnegan, 1969; Darian, 1975), her own education (Treiman and Terrell, 1975; Featherman and Hauser, 1976; McClendon, 1976), and the number and ages of own children (Treiman and Terrell, 1975; Hudis, 1976; Sweet, 1968; Mason, 1974). Accordingly, we have hypothesized that the income of others, her schooling, and her family size affect the hours she has worked. We speculated earlier that early child-bearers may enter the labor force sooner and, therefore, have the benefit of greater labor force experience than their later-bearing sisters. To the extent that a woman's current labor force participation is a function of early participation and correlated with greater total experience, the hours a woman worked in the last year will also be a function of her age at first bitth. Other factors affecting total years of work experience include family size, age at marriage, race, and age (Hofferth, et al., 1978).

Number of children has been found to be a function of education (Michael, 1974; Janowitz, 1976; U.S. Census, 1976), age at first birth (Bumpass et al., 1977; Bonham and Placek, 1975; Presser, 1971; Furstenberg, 1976), number of siblings (Johnson and Stokes, 1976), and timing of first birth with respect to marriage (Bumpass et al., 1977), as well as race, parental socioeconomic status and cohort (U.S. Census Bureau, 1976; Ryder and Westoff, 1971; Westoff et al., 1961; Monthly Vital Statistics, 1976). Although there is some evidence for a simultaneous relationship between labor force participation and fertility (see, for example, Waite and Stoltzenberg, 1976; Weller, 1977) we have hypothesized that in our samples, age at first birth affects labor force participation, rather than vice versa, since all of these women have had a first birth prior to the year in which current work experience is measured. The relationship with prior work experience is more likely to

be simultaneous; however, we don't have enough information to disentangle these effects.

Education. Besides the characteristics of an individual's family of origin such as mother's and father's education and father's occupation and income (Blau and Duncan, 1967; Duncan, Featherman and Duncan, 1972; Sewell and Shah, 1967, 1968), education has been shown to be a function of the home and school environment during the early teen years, including the availability of reading materials in the home, parent-teacher encouragement and help in continuing past high school, parental goals for the child, and high school curriculum (Duncan, 1968; Jencks et al., 1972; Hauser, 1972; Blau and Duncan, 1967; Waite and Moore, 1978). Number of siblings (Blau and Duncan, 1967), race (Blau and Duncan, 1967; Portes and Wilson, 1976; Porter, 1974), farm background (Duncan, Featherman and Duncan, 1972), and cohort (U.S. Bureau of the Census, 1976, No. 295) are also predictive of educational attainment. Finally, although neglected in the attainment literature, there is evidence (see, for example, Waite and Moore, 1978; Bacon, 1974; Trussell, 1975; Furstenberg, 1976; Presser, 1976) that educational attainment is influenced by the age at which a woman has her first birth.

A Non-Recursive Link between Education and Age at First Birth

Cutright (1973) and others have suggested that it is lack of motivation that causes both dropping out of school and early childbearing. According to this interpretation, we should find no relationship between pregnancy and school drop out once motivation is controlled. Measures of educational goals, parent-teacher help and encouragement, and the availability of reading matter were developed as indicators of motivation. We do not find, however, that the relationship between age at first birth and educational attainment disappears when these indicators of educational motivation are included in a regression. The relationship between early childbearing

and schooling does not appear to be spurious. However, the relationship is very likely to be simultaneous. One might expect that a first birth to a teenager frequently precipitates the termination of schooling. It is also likely, though, that the longer a woman attends school, the longer she puts off marriage and childbearing. In this sense, educational attainment can be said to delay the first birth. This suggests that causality operates in both directions, though the particular direction that predominates depends on the sample.

Cross-tabulations of age at first birth by age at termination of schooling indicate that only among childbearers aged 18 and under does either pregnancy or childbearing precede school drop-out in a substantial number of cases. Of those young women who have a first birth while 16 to 18, for example, 70 percent drop out of school within a year of that birth (either 1 year before, in the same year, or in the following year). Of those who have a first birth between 19 and 21, only 25 percent finish schooling within one year of the birth. Most women who are 19 or older when they have their first child have terminated their schooling before the birth. Given the importance of a high school diploma on the job market, the effect of terminating schooling on later life chances should be much greater if that termination occurs before high school graduation.

Thus, although we predict a simultaneous relationship between education and the age at which a woman bears her first child in the full sample, we expect the effect of age at first birth to predominate among those who bear their first at 18 and under. Among those who bear their first child at age 19 or older, we expect the effect of education on age at first birth to dominate. To capture these expectations, we have specified simultaneous causality between age at first birth and educational attainment not

only for the total sample, but also for two subsamples, (1) women 18 or younger at the time of their first birth, and (2) women 19 or older at first birth.

Age at First Marriage and Age at First Birth

Marriage is a critical life cycle transition. The importance of age at marriage to fertility has been documented repeatedly (Bumpass, 1969, for example). In addition, it has been shown that the age at which a woman first marries has a strong effect on the probability of later divorce or separation (Moore and Waite, 1978). Yet in a society in which a substantial proportion of births to teenagers are premarital and in which the largest proportion of young married couples are contracepting one can also argue that it is a birth, not a marriage, that drastically alters many aspects of a woman's life. This is especially likely to be the case for the earliest childbearers.

In general, women marry and then at some later point become pregnant and bear a child. That is, a marriage precedes childbearing in the majority of cases, and is the factor precipitating pregnancy. For example, in the PSID fewer than 7 percent of all women were found to have given birth premaritally. However, for those young women who bore a first child while teenagers, the causal sequence may be reversed. In that sample, 13 percent of first births which occurred before a woman's 19th birthday were premarital, while only 2 percent of first births after her 19th birthday were premarital. Analyses of annual transitions also indicated that among women unmarried at the start of a year, if a birth occurred in that year, the probability of a marriage was also dramatically increased. Thus, a marriage, rather than being a cause of a birth, may be an outcome for the earliest childbearers.

In the analyses of the PSID, we included age at first marriage as an additional outcome of a first birth for those women whose first birth occurred

at 18 or earlier. For those who had their first birth at 19 or later and in the total sample, age at first marriage was assumed to precede a birth and was, therefore, a control variable in the analyses of age at first birth and other dependent variables. In the analyses of the NLS, age at first marriage was included as a control variable in both subsamples and in the total sample. A model specifying simultaneous causation among schooling, age at first birth, and age at marriage is probably the best model for the youngest childbearers. However, in neither data set are there enough independent variables associated with age at first birth and age at first marriage to statistically disentangle their relationship. Of the variables available in the two data sets, we examined race, age, parental socioeconomic status, number of siblings, whether the oldest child, urban or farm background, a foreign-born parent, southern background, religious affiliation (Catholic), and whether or not the respondent grew up with both natural parents as possible determinants of both age at first birth and age at first marriage.

DATA

Analyses were conducted on two national longitudinal data sets, the National Longitudinal Survey of Young Women (NLS) and the Panel Study of Income Dynamics (PSID). Both surveys were initially fielded in 1968 and in each case respondents were interviewed annually. While similar in their focus on economic and employment issues, the two surveys sample quite different populations. Analyses reported here rely on interviews conducted between 1968 and 1972 for the NLS and between 1968 and 1976 for the PSID. Each data set will be described in turn.

The National Longitudinal Survey of Young Women

The National Longitudinal Survey of Young Women (NLS) is funded by the U.S. Department of Labor to study the labor market experiences of contemporary young women. It is designed by the Center for Human Resource Research of Ohio State University and fielded by the U.S. Census Bureau. The initial wave in 1968 sampled over 5000 young women between the ages of 14 and 24. Attempts to reinterview these young women were made annually from 1969 through 1975. Sample retention has been very good. By 1972, the last year considered here, 4625 respondents--90 percent of the original sample--remained in the survey. Since the initial response rate was 94 percent, data on nearly 85 percent of the sample that was initially drawn are available for the current analysis. While these data are among the best available, sample attrition may have reduced the original representativeness, and some caution in generalizing to the entire population is necessary.

In order to produce statistically reliable estimates for black women, households in enumeration districts known to be predominantly black were selected at a rate three times greater than the rate for white enumeration

districts. In 1968, 3638 white women and 1459 black women were interviewed. (Sixty-two young women of other races were interviewed but have been consistently excluded from these analyses because of their diversity.) A sample weight was assigned to each individual case to correct for the fact that different groups of the population had different probabilities of selection. The weights were computed so that the sum of the weights would equal the sample size of 5159.

The NLS data are especially well-suited for a study of the consequences of early childbearing because they follow young women through the teenage and young adult years when family-building typically takes place. For a large proportion of the sample data on marriage and childbearing are not retrospective but are gathered as the events occur. Because extensive information on the educational and work experience as well as the social and economic background of respondents was obtained, detailed comparisons can be made between women who became mothers while teenagers and other young women who postponed their childbearing. Such extensive data are not frequently available for so large or contemporary a sample.

The Michigan Panel Study of Income Dynamics

The Panel Study of Income Dynamics was inaugurated in 1968 to provide information on short run changes in the economic status of families and individuals. To this end, approximately 5000 families have been interviewed annually through 1978. Data obtained through 1976 are included in the current analyses.

The original sample consisted of a cross-section sample of dwelling units within the continental United States plus a subsample of families interviewed in 1967 by the U.S. Bureau of the Census. Since 1968, the sample has consisted of all panel members living in families that were

interviewed the previous year plus newly-formed families that include any adult panel member who had moved out of the sample household since 1968. The addition of newly-formed families has resulted in an increased sample size despite sample attrition.

Panel losses were considerable (24 percent) in the first year but have been relatively minor in recent years. However, the cumulative response rate including initial and subsequent losses, is only 55 percent. The data were weighted in 1972 to adjust both for different sampling fractions and for different rates of nonresponse. Since that time, attrition has not been sufficiently great to warrant further adjustment, and the authors present evidence that estimates made from PSID data correspond closely with estimates obtained from the Current Population Reports (Survey Research Center, 1976, pp. 499-510).

The PSID was explicitly initiated to provide the best possible measures of respondents' family incomes, individual wages, and employment history. The income measures are generally considered to be superior to estimates from the Current Population Survey (Minarik, 1975), and tabular comparisons of both data sets show a high degree of congruence on the weighted distributions of most standard demographic variables (Sawhill et al., 1975). Despite the reassurance that this provides, it seems extremely important to use caution in generalizing from results to the entire United States population.

For the years 1968 to 1975, all information is related to the head of the household. Consequently, little information is available on married women, since they are not defined as heads. Fortunately, in 1976, wives were also interviewed, and detailed information on wives' labor force participation, family background, and earnings was obtained. In addition, wives supplied information on their age at marriage and age at first childbirth, data that

cannot be reliably obtained from some of the interviews held with the husband, who is defined as the head of the household.

Although initial plans called for analyses on all women who turned 24, 30, 36, and 42 during the course of the survey, it soon became clear that a far richer and more complete analysis could be done if emphasis were placed on the sub-set of wives and female heads who were interviewed in 1976. Moreover, the number of women available for analysis was not greatly diminished. Of 2630 wives and female heads aged 16 to 42 in 1968, 156 (6 percent) were not interviewed in 1976. For the 2474 wives and female heads in our sample who were interviewed, there is a wealth of information. The slight loss in sample size seems far outweighed by the additional information available on these women and their experiences.

MEASUREMENT OF AGE AT FIRST BIRTH

Neither the NLS nor the PSID contains a child bearing history for women. Consequently it was necessary to construct such a record for all respondents. The procedure by which this was done for each data set will be described.

The National Longitudinal Survey of Young Women. To develop a measure of the young woman's age at first birth, the household record in 1968 was searched for any sons or daughters of the respondent. The age of the oldest of the respondent's children was subtracted from the respondent's age in 1968 to yield age at first birth. First births which occurred in subsequent survey years were identified by searching the household records of childless respondents. When a first birth was identified, the respondent's age at the last interview was assigned as her Age at First Birth. Since exact birth dates are not known for either the respondent or her children and age is coded only in full years for respondents and children over three, the measure of age at first birth contains some error. Where some uncertainty existed our decision rule erred by assigning the older age at first birth.

The measure of age at first birth used here does not include children who were given up for adoption shortly after birth, who were stillborn, who died in early childhood, or those who were sent to live outside the respondent's household. Own children of the respondent cannot be distinguished from adopted children. We are, then, in effect, measuring the impact of the age at which a young woman takes on the duties and responsibilities of motherhood, the age at which she becomes a parent in a social sense. The variable used here should be a fairly unbiased measure of sociological, if not of biological, motherhood.

Panel Study of Income Dynamics. The measure of age at first birth was determined differently for wives and for female heads. For the 1701 women in

the sample who completed the survey for wives in 1976, the age of her oldest child as reported by the wife was subtracted from the wife's age. No similar information was available for female household heads; consequently the measure of age at first birth for the 773 women who were household heads in 1976 was based on the household record. If a first birth occurred during the survey years, the woman's age in the year of the birth was assigned. Otherwise, the household record for 1968 was searched for the age of the oldest child and this age was subtracted from the woman's own age. Since women in the sample in 1968 could have been as old as 42 in that year, it is possible that some of their children would have grown up and left home. This, of course, would result in an incorrect assignment of age at first birth. This is potentially a problem for heads approximately 32 to 42 years of age in 1968--38 percent of the sample of female household heads or 12 percent of the total sample of women. However, the children most likely to be missed are those born to the youngest mothers, since they are most likely to have grown up and left home before she turned 40. To evaluate this issue, a causal model was developed for women 35 and under, as well as for all women. Analyses among younger women and wives should not be affected by this problem.

Comparison of Age at First Birth Distributions with Current Population Reports

Table 1 presents the weighted proportions of women in the NLS and PSID samples in several age-at-first-birth categories. These distributions can be compared with distributions calculated from data from the 1971 and 1975 Current Population Reports for first births that occurred after the year 1960. The distributions are strikingly similar, although both NLS and the PSID samples have a higher proportion of births among women at older ages. The highest proportion occurs among the total PSID sample, which, as noted above, is

probably elevated by the loss of some early births among older family heads. The young women in the NLS and in the young women PSID sub-sample have few first births that occurred as early as 1960, and since the younger the sample,

Table 1: The Distribution of Women by their Age at First Birth, 1971 and 1975 Current Population Survey (First Births Occurring After 1960), National Longitudinal Survey and Panel Study of Income Dynamics

Age at First Birth	1971 CPS	1975 CPS	NLS at age 24	PSID Total	PSID ≤35 in 1976
≤17	.128	.129	.113	.112	.113
18	.095	.092	.095	.062	.071
19-20	.259	.248	.186	.214	.212
≥21	.518	.530	.607	.633	.605

the more likely the women would have taken part in the trend toward delayed childbirth (U.S. Bureau of the Census, 1978), it seems likely that some of the difference represents true societal changes over time. While the overall correspondence of the NLS and PSID data with Census Bureau data is most encourgaging, it should be kept in mind that some inaccuracy due to coding and missing information was unavoidable. As always, our results should be considered within the context of the findings of other researchers, as well as one's own theoretical expectations.

RESULTS

Separate analyses were conducted on both the NLS and PSID data. Initially, a subsample of NLS women who turned 27 during the years of the survey and who had borne at least one child was analyzed. By that age, we reasoned, their economic positions should be relatively settled. However, because most NLS respondents were still under age 27, this sample is small. For this reason, and because these women are still fairly young, we conducted similar analyses focusing on the PSID women who had had a child by 1976. The average age of these women in that year is 38.

Since we expected the effects of the age at which a woman bears her first child to be strongest among those who gave birth while still in high school, we divided each data set into two subsets: those who had a first birth at 18 or earlier and those who had a first birth at 19 or older. We then examined the effects of age at first birth on the earnings of thse women, on the earnings of their husbands or other contributors to household income, and on the poverty status of their households at age 27 (NLS) or in 1976 (PSID).

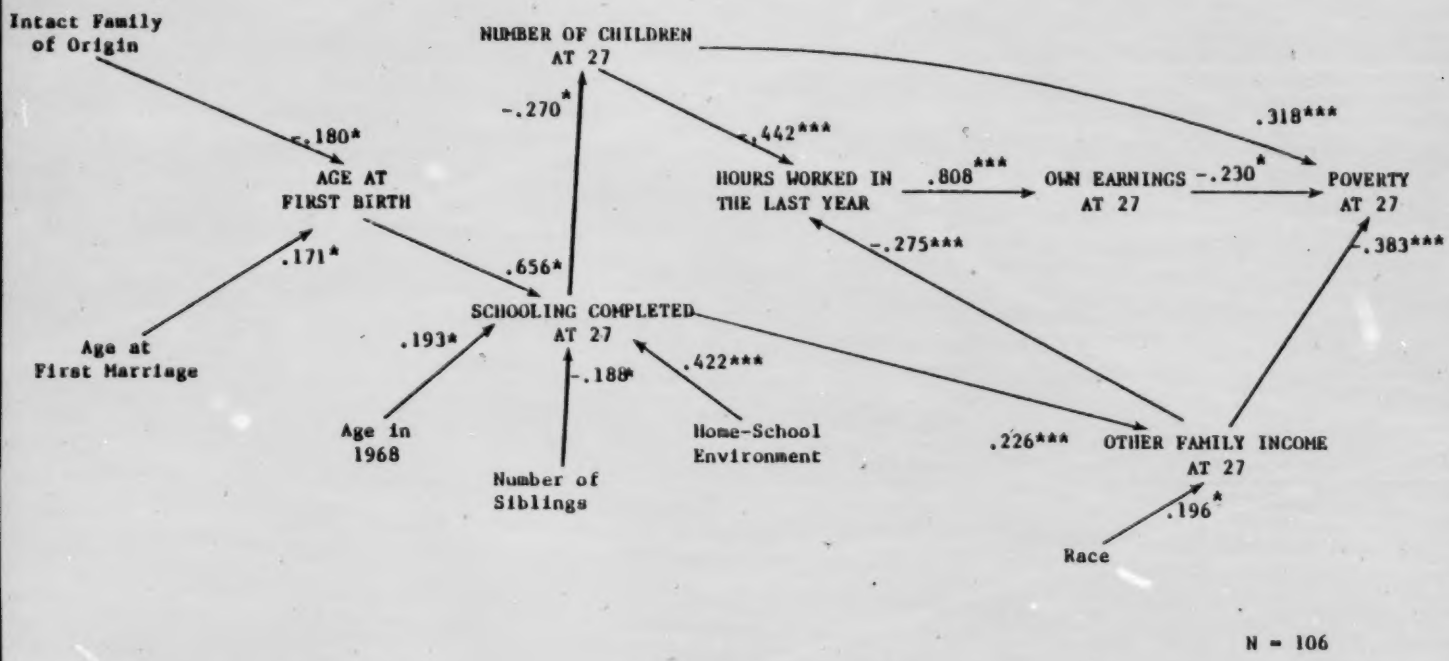
Variable definitions, means, and standard deviations are reported in Appendix Tables 1 and 2. Results are displayed in path model form in Figures 2-5. Results for NLS women with a first birth at 18 or younger are depicted in Figure 2, while results for NLS women 19 or older at first childbirth are shown in Figure 3. Results for younger and older PSID mothers are presented in Figures 4 and 5, respectively.

Estimation of the Non-Recursive Link Between Education and Age at First Birth

As dipicted in the path diagrams (Figures 2-5), there are two instruments predicting to age at first birth and educational attainment. Thus the model is over-identified, and two-stage least squares gives consistent unbiased parameter

Figure 2

Path Model, Age at First Birth Less Than or Equal to 18[a/] (National Longitudinal Survey)



a/ standardized coefficients

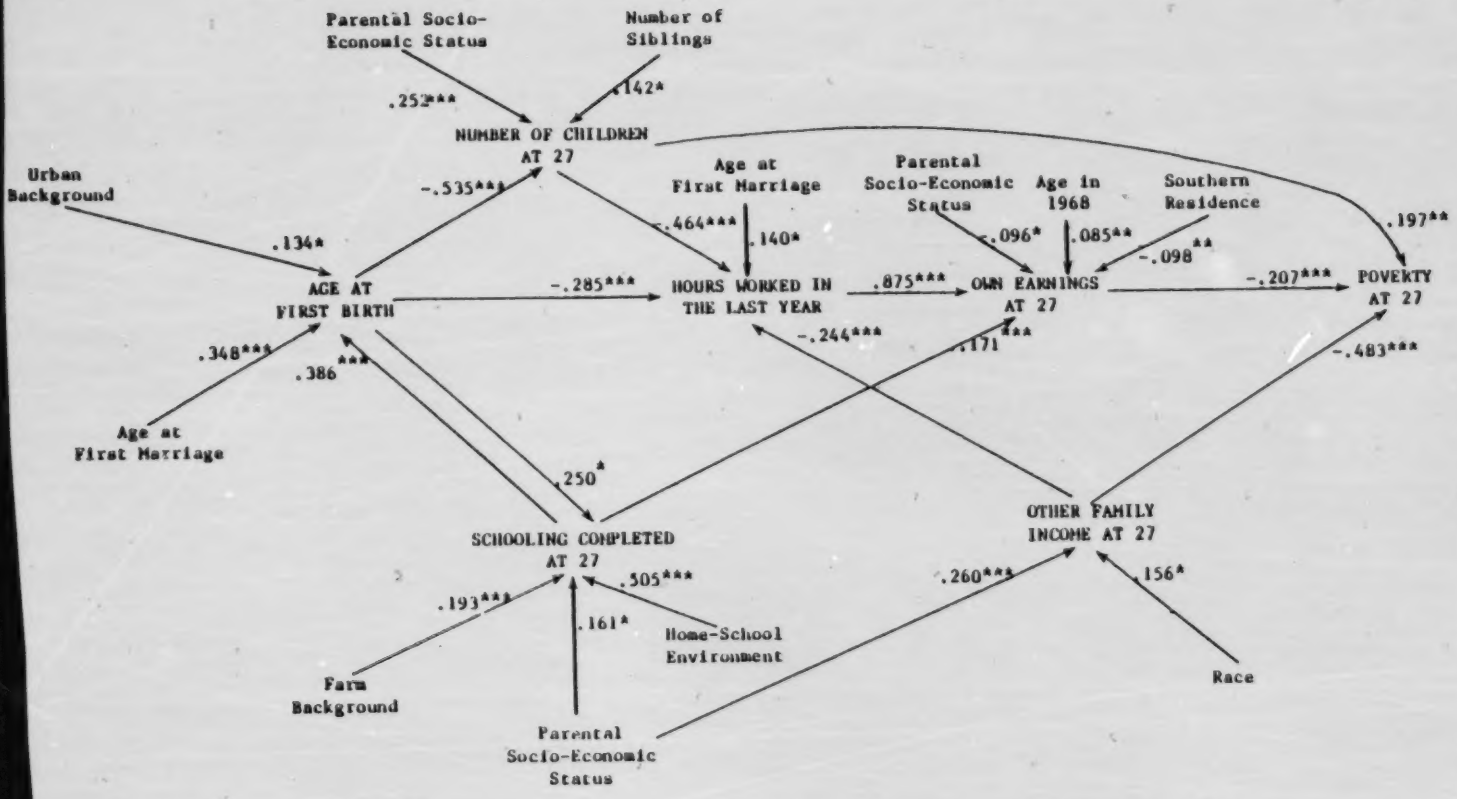
* $p < .05$

** $p < .01$

*** $p < .001$

Figure 3

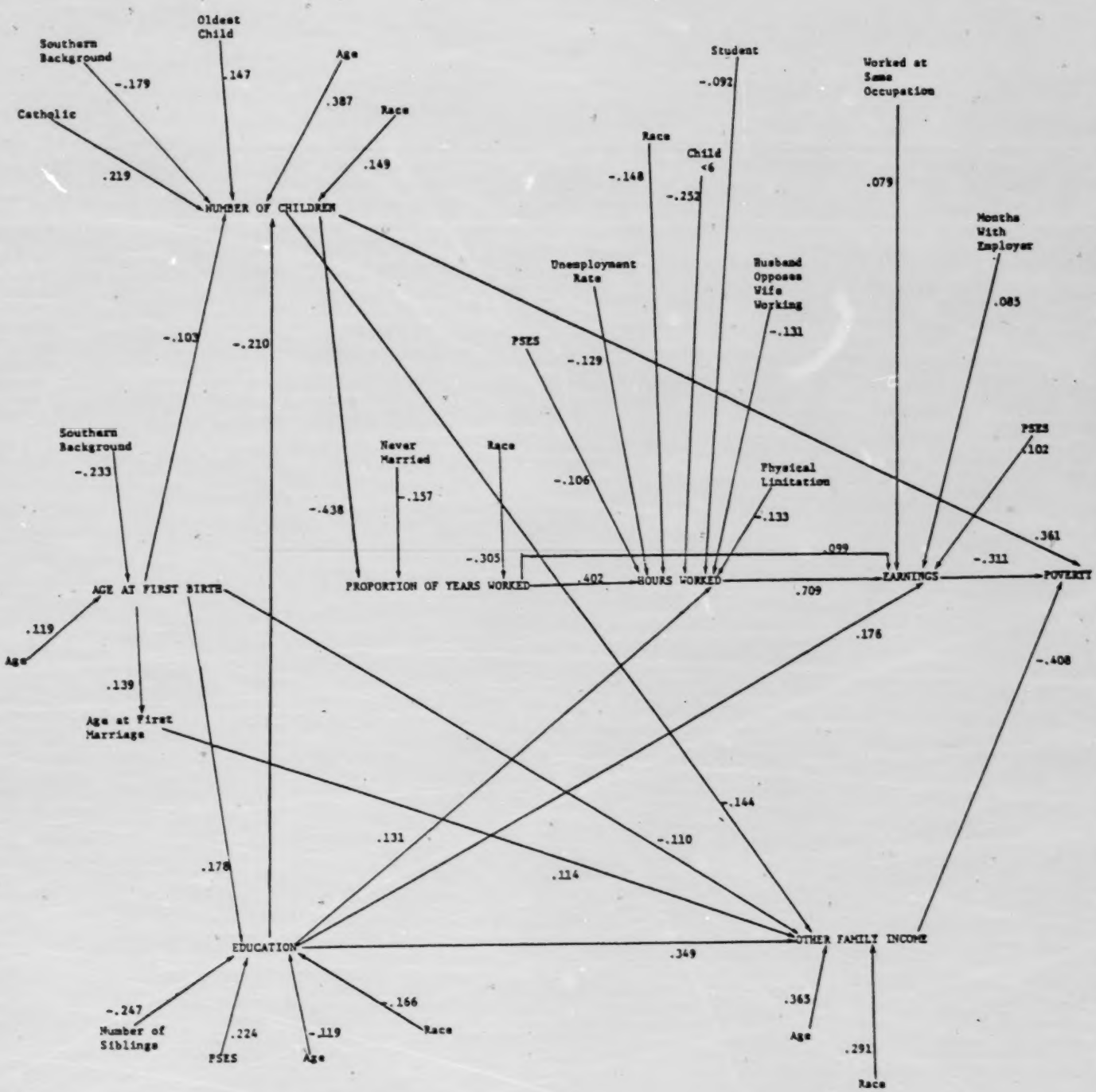
Path Model, Age at First Birth Greater Than 18 and Less Than 27[a/]
(National Longitudinal Survey)



N = 223

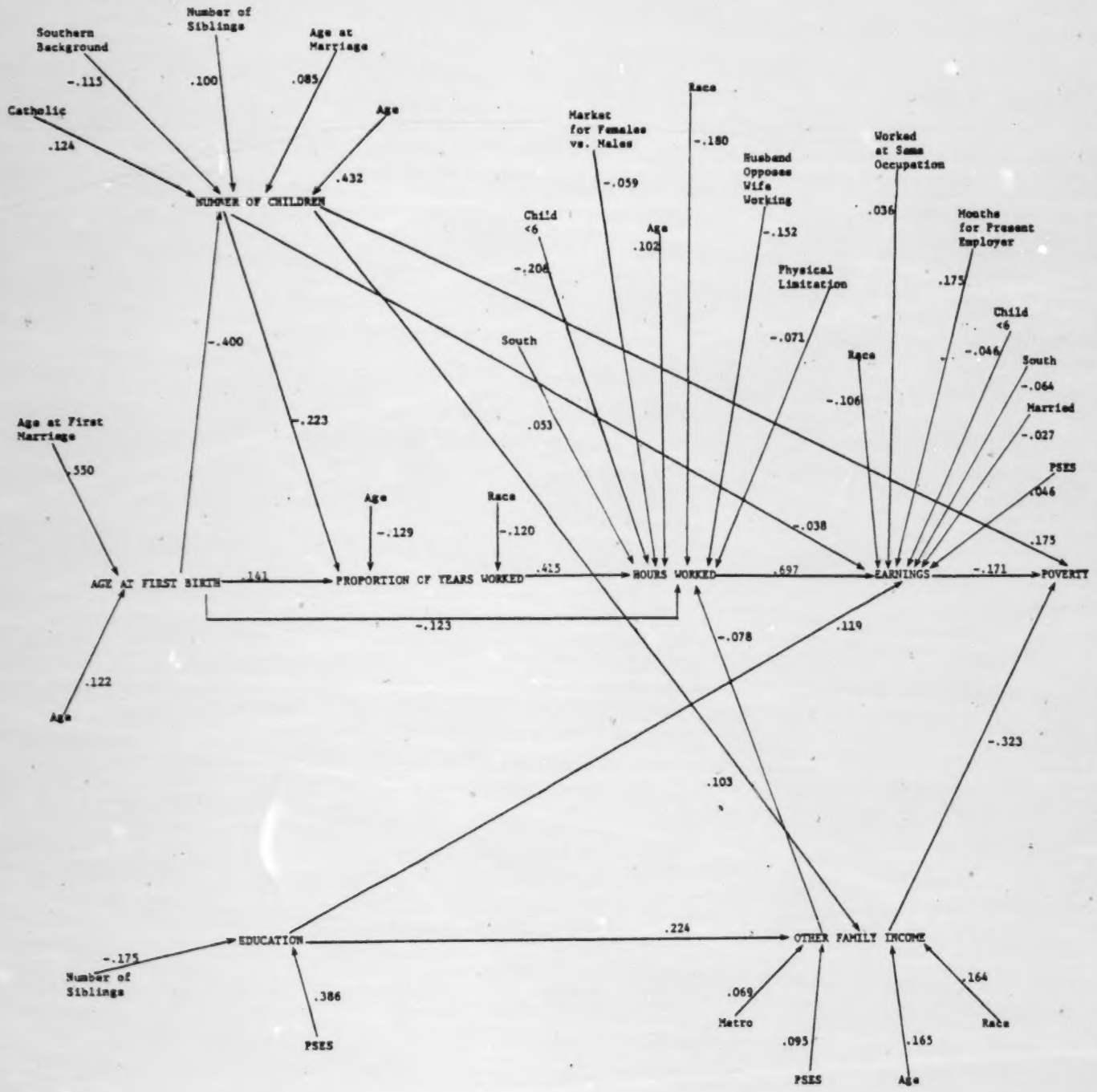
a/ standardized coefficients
* p < .05
** p < .01
*** p < .001

Figure 4 Path Model, Age at First Birth Less Than or Equal to 18 (Panel Study of Income Dynamics)



a/ Standardized Coefficients; Only those significant at the .05 level or better are presented here.

Figure 5 Path Model, Age at First Birth Greater than 18[a/] (Panel Study of Income Dynamics)



a/ Standardized Coefficients; Only those significant at the .05 level or better are presented here.

estimates. Because of the attention in economic and sociological literature recently to simultaneity problems (see, for example, Johnston, 1972; Duncan, 1975; and Heise, 1975), we will not discuss the problems of identification and estimation in simultaneous equations in detail.

The top panels of Tables 2 and 3 present the two stage least squares (2SLS) and the ordinary least squares (OLS) estimates for women whose first child was born when they were 18 or younger. In the 2SLS estimates, both ecuation and age at first birth are dependent variables simultaneously, while in the OLS estimates, only one variable is a dependent variable at a time.

Results of the models permitting simultaneous causality support the hypothesis that an early birth has a causal impact on schooling among these sub-samples of early childbearers. In fact, in the simultaneous model, the impact of a birth is strengthened in the NLS equation, though it is weakened slightly in the PSID equation. On the other hand, there is no evidence that schooling affects age at first childbirth in the simultaneous model. In other words, the causal direction is <u>from</u> childbearing <u>to</u> schooling. The effect of the age at which a woman has her first birth seems to be very strong if she has that first birth while she is yet of high school age, but there is no evidence of reciprocal causation.

When women who were at least 19 at the time their first child was born are considered, however (see the bottom panels of Tables 2 and 3), the picture is quite different. Among NLS mothers who were at least 19 when their first child was born, there is evidence of simultaneous causality. The impact of a birth on educational attainment is much smaller than it is among the school-age mothers, while the impact of schooling on age at first birth becomes significant and large. Indeed, among mothers at least 19 at their first birth, the impact of schooling on age at first birth is larger than the

Table 2: Standardized OLS and 2SLS Estimates of the Relationship Between Educational Attainment and Age at First Birth (National Longitudinal Survey)

	Age at First Birth ≤ 18			
	Education Dependent		Age at First Birth Dependent	
	2SLS	OLS	2SLS	OLS
Age in 1968	.193*	.173*	a	b
Parental Socioeconomic Status	a	b	a	b
Intact Family of Origin	a	b	-.180*	-.236*
Age at First Marriage	a	b	.171*	.214*
Urban Background	a	b	a	b
Farm Background	a	b	a	b
Home School Environment	.422***	.432***	a	b
Number of Siblings	-.188*	-.236**	a	b
Educational Attainment	c	c	.170ns	.416***
Age at First Birth	.656*	.375***	c	c
R^2	.42	.46	.18	.28
N	106	106	106	106

	18 < Age at First Birth ≤ 27			
	2SLS	OLS	2SLS	OLS
Age in 1968	a	b	a	b
Parental Socioeconomic Status	.161*	.171**	a	b
Intact Family of Origin	a	b	a	b
Age at First Marriage	a	b	.348***	.360***
Urban Background	a	b	.134*	.145*
Farm Background	.193**	.190***	a	b
Home School Environment	.505***	.476***	a	b
Number of Siblings	a	b	a	b
Educational Attainment	c	c	.386***	.385***
Age at First Birth	.250*	.277***	c	c
R^2	.51	.52	.33	.35
N	223	223	223	223

a variable included in model but not this equation
b variable excluded from this equation
c variable is dependent variable in this equation
* $p < .05$
** $p < .01$
*** $p < .001$

Table 3: Standardized OLS and 2SLS Estimates of the Relationship Between Education and Age at First Birth (Panel Study of Income Dynamics)

	Age at First Birth <18			
	Education Dependent		Age at First Birth Dependent	
	2 SLS	OLS	2 SLS	OLS
Age in 1976	-.119*	-.051*	.119*	.265***
Parental SES	.224***	.370***	.093	.076**
White	-.166**	-.012	.068	-.091***
Farm Background	.013	.062**	-.011	-.002
Southern Background	a	b	-.233***	-.005
Number of Siblings	-.247***	-.168***	a	b
Oldest	-.030	-.064**	a	b
Catholic	a	b	.083	.012
Age at First Marriage	a	b	a	b
Education	c	c	-.047	.375***
Age at First Birth	.178**	.348***	c	c
R^2		.195		.158
N		347.		347.

	Age at First Birth >18			
Age in 1976	-.079	-.043	.122***	-.099***
Parental SES	.386***	.381***	-.093	.034
White	.009	.052	.039	.056*
Farm Background	.020	.053*	b	b
Foreign	-.053*	-.069**	b	b
Southern	-.022	-.007	.034	.044
Number of Siblings	-.175***	-.188***	.070	.042
Oldest	a	b	.027	.055
Catholic	a	b	-.030	-.040
Age at First Marriage	-.074	.168***	.350***	.643***
Education	c	c	.200	.085***
Age at First Birth	.304	.111***	c	c
R^2		.309		.471
N		1,352.		1,352.

a = variable included in model but not this equation
b = variable excluded from this equation
c = variable is dependent variable in this equation

* = $p < .05$
** = $p < .01$
*** = $p < .001$

impact of a birth on schooling. Among PSID mothers who were at least 19 at first childbirth, neither effect is statistically significant; factors other than education determine the timing of the first birth among these older women and factors other than fertility determine educational attainment. Thus, the crucial causal impact of a birth on educational attainment seems to be concentrated among teenage mothers. This makes some intuitive sense. Among women who become mothers at older ages, more varied and personal factors are likely to affect schooling and the timing of childbearing. Among women who first become mothers during the high school years, however, the fact of that birth seems to intrude upon and supersede other factors that would normally determine educational attainment.

PSID Subsample of Women 35 and Younger. Because of the problems in measuring age at first birth among older women in the PSID who were household heads in 1976 (see page 19), the relationship between age at first birth and educational attainment among those women who were 35 or younger in 1976 was also analyzed. Among these women the measure of age at first birth should be most accurate; the results should, therefore, reflect its real relationship with education. In fact, the results are almost identical to those using women of all ages. In the total sample of women who were 35 or younger in 1976, not subdivided by age at first birth, and in that subsample of women who were 19 or older at their first birth, there is neither an effect of a first birth on educational attainment nor an effect of educational attainment on age at first birth. However, again as in the sample of women of all ages, for those whose first birth occurred when they were 18 or younger, age at first birth does affect educational attainment, but educational attainment has no reciprocal effect on age at first birth. The size of the effects of age at first birth on schooling in this subsample

of women 35 and younger is comparable in magnitude to that found among women of all ages: 1.04 in the former and .94 in the latter sample (metric coefficients). For women 18 and younger at their first birth, each year a birth is delayed is associated with an increase in schooling completed of about one full year.

Direct, Indirect and Total Effects of Age at First Birth

Because we are only interested in the direct, indirect, and total effects of age at first birth, not in the total association (due to common causes, correlated causes, and so on; see Alwin and Hauser, 1975), we have first eliminated the loop by semi-reducing age at first birth and educational attainment on their disturbances (see, for example, Heise, 1975), eliminated the paths due to exogenous variables, and redrawn our model to show only the variables endogenous to age at first birth and their corresponding paths (e.g., Figure 1).[1] In Tables 4 through 7, we present the standardized and unstandardized coefficients for all relationships in the model, for each sub-sample. In Tables 8 and 9, we summarize the path analysis by presenting the direct, indirect, and total effects of age at first birth on each endogenous variable.[2] We focus here on the effects of age at first birth on the components of household income and on poverty, although the effects on the intervening variables can also be specified. These results are calculated and presented separately for the two sub-samples of women. Results are also presented for the entire sample in Tables 8 and 9, but will not be discussed in detail.

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1. Those variables exogenous to age at first birth drop out in the calcuation of indirect effects.

2. All relationships were estimated by OLS except for that between educational attainment and age at first birth, which was estimated by 2SLS.

Table 4
OLS/2SLS Estimation of Each Path: Age at First Birth Less Than/Equal to 18
(National Longitudinal Survey)

Dependent Variable	Southern Residence	Intact Family	Age at Marriage	Urban Background	Farm Background	Number of Siblings	Home-School Environment	Parental SES	Age in 1966	Race	Age at First Birth	Education at 27	Number of Children at 27	Hours Worked in Last year	Own Earnings at 27	Other Family Income at 27	Constant	R^2
								STANDARDIZED										
Age at First Birth		-.180	.171									.170						
Education at 27						-.188	.422		.193		.656							
Number of Children at 27						-.132		-.022	-.099	-.063	-.152	-.270						
Hours Worked Last Year								-.004	-.019	-.053	.006	-.125	-.442			-.275		
Own Earnings at 27	.083							.073	.053	.035	-.004	.132	.045	.808		-.094		
Other Family Income at 27	-.0007							-.033	.106	.196	-.002	.226	.033					
Poverty													.318		-.230	-.383		
								METRIC[a]									Constant	R^2
Age at First Birth		-.581 (.291)	.090 (.045)									.139 (.127)					14.32	.18
Education at 27						-.139 (.063)	.358 (.067)		.596 (.260)		.803 (.339)						-19.24	.42
Number of Children at 27						-.068 (.053)		.011 (.052)	.216 (.215)	.204 (.312)	.131 (.090)	-.191 (.079)					12.50	.16
Hours Worked in Last Year								-1.88 (37)	-32 (153)	-131 (223)	3.95 (65)	-68 (57)	-338 (71)			-.030 (.010)	3379	.26
Own Earnings at 27	382 (278)							79 (67)	243 (276)	239 (401)	-7.86 (116)	193 (104)	94 (144)	2.18 (.181)		-.027 (.018)	-8478	.68
Other Family Income at 27	-12 1554							-122 (377)	1637 (1537)	4431 (2195)	-14 (652)	1123 (568)	235 (725)				-44692	.11
Poverty													.096 (.026)		-.00003 (.00001)	-.00002 (.0000)	.058	.31

a/ standard errors in parentheses

Table 5

OLS/2SLS Estimation of Each Path: Age at First Birth Greater Than 18 and Less Than 27

(National Longitudinal Survey)

Dependent Variable	Southern Residence	Intact Family	Age at Marriage	Urban Background	Farm Background	Number of Siblings	Home-School Environment	Parental Socio-Economic Status	Age in 1968	Race	Age at First Birth	Education at 27	Number of Children at 27	Hours Worked in Last Year	Own Earnings at 27	Other Family Income at 27	Constant	R^2
								STANDARDIZED										
Age at First Birth			.348	.134								.386						
Education at 27					.193		.505	.161			.250							
Number of Children at 27						.142		.252	-.092	-.030	-.535	-.070						
Hours Worked Last Year			.140					-.019	-.078	.003	-.285	.065	-.464			-.243		
Own Earnings at 27	-.098							-.096	.085	-.047	-.002	.171	.023	.875		.024		
Other Family Income at 27	.038							.260	.040	.155	.078	.058	.084					
Poverty													.197	.	-.207	-.483		
								METRIC[a]									Constant	R^2
Age at First Birth			.328 (.054)	.696 (.291)								.472 (.102)					8.75	.33
Education at 27					.104 (.026)		.418 (.054)	.122 (.045)			.205 (.092)						2.77	.51
Number of Children at 27						.053 (.023)		.086 (.023)	-.154 (.094)	-.089 (.180)	-.198 (.025)	-.032 (.031)					9.33	.33
Hours Worked in Last Year			46 (22)					-6 (23)	-125 (94)	8 (178)	-100 (28)	28 (31)	-441 (67)			-.03 (.009)	5523	.26
Own Earnings at 27	-612 (212)							-110 (46)	477 (184)	-476 (343)	-3 (52)	258 (60)	77 (143)	3 (.13)		.011 (.018)	-12,884	.78
Other Family Income at 27	473 (818)							597 (174)	448 (714)	3139 (1317)	194 (201)	175 (235)	564 (512)				-17,558	.14
Poverty													.069 (.021)		-.00002 (.00001)	-.00003 (.00000)	.237	.29

a/ standard errors in parentheses

Table 6: OLS/2SLS Estimates of Path Coefficients. Age at First Birth Less Than/Equal to 18. (Panel Study of Income Dynamics)

Dependent Variables	Experience Squared	Had a Foreign Born Parent	Wage Rate for Females vs. Males	Unemployment Rate	AFDC Benefit Level	Worked Generally At Same Occupation	Months Worked For Present Employer	Has a Child Under 6	Enrolled in School	Husband's Attitude Toward Wife's Employment	Has a Physical Limitation	Southern Resident	Metropolitan Resident	Currently Married	Never Married	Timing of First Birth (Premarital)	Farm Background	Southern Background	Catholic	Oldest Child	Number of Siblings	Age at First Marriage	PSID	Age in 1976	Race	Age at First Birth	Education	Number of Children	Proportion of Years Worked	Hours Worked Last Year	Own Earnings	Other Family Income	Constant	R^2	F
STANDARDIZED[a]																																		
Age at First Birth																	-.011	-.233*	.083				.093	.119*	.048		.047								
Education																	.013			-.030	-.347*		.224*	-.119*	-.166*	.178*									
Number of Children																-.087	-.059	-.179*	.219*	.147*	-.017	.002	-.056	.387*	-.149*	-.103*	-.210*								
Proportion of Years Worked															-.157*		.037	-.008				.031	.044	.025	-.305*	.015	.010	-.438*						
Hours Worked Last Year			.030	-.129*	.041			-.252*	-.092*	-.131*	-.133*	.043	-.056	.097								-.038	-.084*	.014	-.148*	-.006	.131*	-.043	.402*			.002			
Own Earnings			.029			.079*	.085*	-.007		-.039	-.051	.006	.032	-.029								.033	.102*	.035	.032	-.037	.176*	.036	.099*	.709*		-.021			
Other Family Income												.086	.010									.114*	.039	.365*	.291	-.110*	.349*	-.144*							
Poverty																												.361*			-.311*	-.408*			
METRIC[a]																																		
Age at First Birth																	-.028 (.123)	-.518 (.126)	.3o4 (.359)				.050 (.046)	.018 (.007)	.181 (.138)		-.062 .129)						16.71		
Education																	.035 (.20)			-.132 (.203)	-.197 (.040)		.210 (.051)	-.032 (.013)	-.765 (.246)	.943 (.330)							- 6.74		
Number of Children																-.499 (.39)	-.285 (.207)	-.712 (.206)	.865 (.215)	.566 (.196)	-.012 (.041)	.002 (.040)	-.044 (.050)	.124 (.013)	-.802 (.266)	-.205 (.094)	-.251 (.055)						7.06	.50	28.44
Proportion of Years Worked															-.333 (.014)		.040 (.034)	-.004 (.034)				.004 (.007)	.007 (.008)	.001 (.002)	-.241 (.065)	.004 (.015)	.001 (.009)	-.065 (.009)					.63	.29	14.00
Hours Worked Last Year			58 (88)	-4337 (1712)	.36 (.47)			-426 (99)	-1787 (786)	-270 (96)	-423 (137)	81 (102)	-104 (84)	288 (149)								-13 (28)	-34 (22)	2 (8)	-350 (129)	-5 (39)	69 (26)	-19 (29)	1194 (144)			.0002 (.006)	762	.48	15.73
Own Earnings			220 (210)			527 (209)	7 (3)	-48 (253)		-317 (233)	-633 (341)	46 (214)	237 (206)	-344 (368)								54 (50)	203 (55)	19 (21)	295 (317)	-128 (95)	358 (64)	61 (72)	1155 (393)	3 (1.14)		-.01 (.03)	- 5,832	.80	68.53
Other Family Income												1317 (831)	162 (800)									393 (193)	164 (211)	422 (64)	5644 (1087)	-799 (362)	1512 (233)	-521 (217)					-16,936	.25	12.62
Poverty																												.092 (.01)			-.00004 (.00000)	-.00003 (.00000)	.45	.53	132

a/ * = Significant at the .05 level or better

b/ Standard errors in parentheses

Table 7: OLS/2SLS Estimates of Path Coefficients: Age at First Birth Greater Than 18 (Panel Study of Income Dynamics)

Dependent Variable	Experience Squared	Had a Foreign Born Parent	Market for Females vs. Males	Unemployment Rate	AFDC Benefit Level	Worked Generally At Same Occupation	Months Worked For Present Employer	Has a Child Under 6	Enrolled in School	Husband's Attitude Toward Wife's Employment	Has a Physical Limitation	Southern Resident	Metropolitan Resident	Currently Married	Never Married	Timing of First Birth (Premarital)	Farm Background	Southern Background	Catholic	Oldest Child	Number of Siblings	Age at First Marriage	PSES	Age in 1976	Race	Age at First Birth	Education	Number of Children	Proportion of Years Worked	Hours Worked Last Year	Own Earnings	Other Family Income	Constant	R^2	F
STANDARDIZED[a]																																		
Age at First Birth																		.034	-.030	.027	.070	.550*	-.093	.122*	.039		.200								
Education		-.053*															.020	-.022			-.175*	-.074	.386*	-.079	.009	.304								
Number of Children		.012														-.012	.022	-.115*	.124*	-.012	.100*	.085*	-.016	.432*	.029	-.400*	-.045							
Proportion of Years Worked															-.005		.025	.032				-.012	-.044	-.129*	-.120*	.141*	.009	-.223*						
Hours Worked Last Year			-.059*	-.036	.017			-.206*	-.008	-.152*	-.071*	.053*	.017	-.006								-.012	.051	.102*	-.180*	-.123*	.017	-.027	.415*			-.078*			
Own Earnings			-.015			.036*	.175*	-.046*		-.0007	-.0008	-.064*	.024	-.027*								.030	.046*	-.016	-.106*	.025	.119*	-.036*	-.001	.697*		.017			
Other Family Income												-.019	.069*									.014	.095*	.165*	.164*	-.025	.224*	.103*							
Poverty																												.175*			-.171*	-.323*			
METRIC[b]																																		
Age at First Birth																		.269 (.195)	-.331 (.203)	.196 (.181)	.099 (.096)	.718 (.102)	-.134 (.203)	.055 (.011)	.503 (.342)		.572 (.555)						-.45		
Education		-.724 (.373)															.099 (.142)	-.106 (.176)			-.152 (.024)	.059 (.291)	.342 (.039)	-.022 (.020)	.049 (.294)	.287 (.356)						4.80		
Number of Children		.127 (.230)														-.138 (.273)	.090 (.098)	-.400 (.092)	.448 (.089)	-.043 (.984)	.064 (.018)	.052 (.020)	-.011 (.019)	.095 (.005)	.132 (.128)	-.191 (.015)	-.036 (.022)						2.72	.34	53.93
Proportion of Years Worked															.016 (.084)		.018 (.019)	.020 (.018)				-.001 (.003)	-.003 (.004)	-.005 (.001)	-.098 (.024)	.012 (.003)	.001 (.004)	-.040 (.005)					.69	.14	22.39
Hours Worked Last Year			-111 (42)	-1087 (808)	.147 (.234)			-395 (57)	7 (197)	-299 (46)	-223 (69)	108 (50)	35 (46)	-16 (65)								-4 (10)	19 (9)	12 (4)	-441 (59)	-31 (8)	7 (11)	-14 (14)	1244 (73)			-.005 (.002)	1042	.40	46.01
Own Earnings			-150 (124)			343 (126)	15 (1)	-463 (174)		-72 (139)	-13 (208)	-635 (122)	249 (133)	-384 (195)								51 (30)	90 (28)	-10 (12)	-1352 (177)	33 (25)	268 (34)	-104 (43)	-15 252)	6 (08)		.006 (.005)	-3928	.80	276.52
Other Family Income												-518 (687)	888 (716)									63 (158)	501 (153)	270 (49)	5627 (900)	90 (129)	1417 (179)	765 (1226)				-23892	.16	28.42
Poverty																												.026 (.004)			-.000009 (.0000)	-.000006 (.0000)	.135	.14	76.65

a/ * = Significant at the .05 level or better

b/ Standard errors in parentheses

Table 8: Effects of Being One Year Older at First Birth on Measures of Economic Wellbeing at 27 (National Longitudinal Survey)

Age at First Birth ≤ 18

Dependent Variable	Total Effect b/	Indirect Effect Through: Education	Number of Children	Hours	Direct Effect
Own Income a/	$ 73	$ 73	0	0	0
Other Family Income a/	$1220	$1220	0	0	0
Poverty	-2.5 percentage points	-2.5 percentage points	0	0	0

18 < Age at First Birth < 27

Dependent Variable	Total Effect	Indirect Effect Through: Education	Number of Children	Hours	Direct Effect
Own Income a/	$16	$72	$364	-$420	0
Other Family Income a/	0	0	0	0	0
Poverty	-1.4 percentage points	-0.7 percentage points	-1.3 percentage points	+0.7 percentage points	0

Full Sample (Age at First Birth < 27)

Dependent Variable	Total Effect	Indirect Effect Through: Education	Number of Children	Hours	Direct Effect
Own Income a/	$-13	$82	$254	-$349	0
Other Family Income a/	$166	$166	0	0	0
Poverty	-1.6 percentage points	-0.5 percentage points	-1.7 percentage points	+0.6 percentage points	0

a/ 1976 dollars
b/ The total effect is the sum of the direct and indirect effects.

Table 9 : Effects of Being One Year Older at First Birth on Measures of Economic Well-Being in 1976 (Panel Study of Income Dynamics)

Age at First Birth ≤ 18

Dependent Variable	Total[b] Effect	Indirect Effect Through: Education	Number of Children	Age at First Marriage	Hours	Other Family Income	Direct Effect
Own Income[a]	$243	$184	$ 59	0	0	0	0
Other Family Income[a]	-$ 87	$487	$109	$116	0	0	-$799
Poverty (in percentage points)	-3.3	-2.9	-2.4	-.3	-	+2.3	0

Age at First Birth > 18

Dependent Variable	Total[b] Effect	Indirect Effect Through: Education	Number of Children	Experience	Hours	Other Family Income	Direct Effect
Own Income[a]	-$ 3	0	$ 58	$53	-$114	0	0
Other Family Income[a]	-$146	0	-$146	0	0	0	0
Poverty (in percentage points)	-. 45	0	-.50	-.05	+.10	0	0

Total Sample

Dependent Variable	Total[b] Effect	Indirect Effect Through: Education	Number of Children	Experience	Hours	Other Family Income	Direct Effect
Own Income[a]	$ 8	0	$ 39	$34	-$ 67	0	0
Other Family Income[a]	0	0	0	0	0	0	0
Poverty (in percentage points)	-1.30	0	-1.36	-.05	+ .11	0	0

[a] 1976 Dollars

[b] The total effect is the sum of the direct and indirect effects.

The Effect of Age at First Birth Among Those Who Bear A First Child Before Age 19--Detailed Results [1]

Effect on Own Earnings [2]

For a woman in the NLS who bears her first child at 18 or earlier, waiting one more year before a first birth is associated with increased earnings at age 27 of $73 for each such year (Table 8). This is due entirely to the additional 4/5 of a year of education that she can be expected to complete as a result. Findings are similar, but even stronger, in the PSID. A woman who delays that first birth for one year can expect to reap increased earnings in 1976 of $243 for each such year (Table 9). In this data set (PSID) 4/5 of the effect on own earnings is a result of the additional full year of schooling such a woman will be able to complete; one fifth of the effect is due to a reduction of 5 percent in the number of children she will eventually have. Greater education and reduced family size have been shown to be associated with increased labor force experience and earnings among women.

Effect on Other Household Income

There are substantial but different effects of an early first birth on other household income in the NLS and PSID samples. Among NLS young women who bear a first child while under 19, the effect of a first birth on other household income is stronger and more important than that on the woman's income. Associated with an additional year of delay of a first birth is an increase in the income of her husband or other household provider at age 27 of $1220. In contrast, among women in the PSID who have their first child

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1. All effects in this and subsequent sections are in 1976 dollars.
2. Women with no earnings are included in these samples. The effects would probably be much larger if such women were excluded; however, by so doing a substantial and important group of women would be lost. Own earnings is only one of the factors contributing to the economic well-being of women.

while under 19, we found that a delay of one year in bearing that first child is associated with a decline of $87 in other family income in 1976. Although this effect is not large, it is surprising. There are both positive and negative effects of a first birth on other family income; however, the negative effect outweighs the positive ones.

The Positive Effect Through Education. The effect on household income of delaying a birth one year is $1220 in the NLS. This effect is due entirely to the 4/5 additional year of education that the young women can be expected to complete. This increased schooling presumably increases her availability and attractiveness as a spouse to men of higher earnings potential. Similarly, in the PSID a year delay in having a first birth is associated with an increase in other family income in 1976 of $487, an increase related to the greater educational attainment of such women. This effect, though smaller than that in the NLS, is still substantial.

The Positive Effect Through Family Size. In addition, in the PSID, a first birth delayed one year is associated with an increase in other family income of $109. This is because later childbearers have fewer children and smaller family size is associated with increased family income in this sample. There is no effect of age at first birth solely through family size in the NLS.

The Positive Effect Through Age at First Marriage. In the PSID, there is a small positive effect on other household income in 1976 of delaying a first birth for one year--a $116 increase for each such year. This is due to the earlier marriages of those with early births. Early marriage has been shown to be associated with greater marital instability and, as a result, a greater chance of being a female family head in 1976.

The Negative Direct Effect. PSID analyses also indicate that there is a substantial direct negative effect of a later first birth on other family

income, which negates the positive effects. Although we are not sure why delaying a first birth would be associated with lower incomes of other family members in this sample of school-age mothers, the result is consistent with earlier analyses which indicate that, among the youngest childbearers, those who had the earliest births, e.g., those 15 and under, are <u>least</u> disadvantaged. Perhaps they do not marry immediately, as the 16 and 17 year olds may be more prone to do. As a result they may remain with their families and receive greater economic and emotional support than do the older teenage mothers. Perhaps they enter somewhat later into more stable marriages and as a result are better off by the time they enter their thirties.

The possibility that early childbearers live in larger households with more earners was explored; however, no evidence was found suggesting that a difference in household size accounts for this finding. Cross-tabulations of age at first birth and the incomes of other family members indicate that, in fact, the earliest childbearers (less than 16) are slightly better off than those who bear a first child at 16 or 17, who are, as expected, not as well off as those who wait until age 18. Thus the relationship between age at first birth and other family income appears to be curvilinear in the PSID. As a result, an analysis assuming the relationship to be approximately linear cannot approximate the true relationship. The analyses using dummy variables for categories of age at first birth do not force a linear model on the relationship and may be preferable. However, causal modeling procedures using dummy variables are not as highly developed as those assuming linear relationships between variables. Transformations of the earnings variables were tried, but did not substantially affect the results, while complicating their interpretation and comparison. Since other family income seems to be the only outcome whose relationship with age at first birth appears to substantially violate the linearity assumption, we do not feel that the rest of the analyses

are suspect for this reason. In addition, despite its positive association with other family income, an early birth does appear to substantially increase the probability of being poor.

Effect on Poverty

Because of the substantial size of its effect on the woman's earnings (PSID) and on other household income (NLS) we can expect age at first birth to substantially affect the probability of the woman's household being in poverty. For each year a woman delays a first birth the probability of her household being in poverty at 27 (NLS) is reduced by 2.5 percentage points. Since the average proportion of this sample in poverty is 12 percent, this implies a reduction of 20 percent for each year a birth is delayed, a substantial reduction. Again, this effect is due entirely to the additional schooling a young woman will be able to complete if her first birth occurs at 16, for example, instead of 15.

Results from the PSID sample of women in 1976 are similar to those of the NLS. For each year a woman delays a first birth the probability of her household being in poverty in 1976 (PSID) is reduced by 3.3 percentage points. However, since a substantial proportion of this group is poor (39 percent), this represents a reduction of only 8 percent for each year a birth is delayed. This overall effect on poverty has two components, one positive and one negative. Seventy percent of this effect is a result of the increased education completed and reduced family sizes associated with delaying a first birth one year. The remainder of this effect, a small positive one, increases the proportion in poverty due to the lower other family incomes of later childbearers in the PSID.

The Effect of Age at First Birth Among Those Who Bear a First Child at 19 or Later--Detailed Results

Effect on Own Earnings

Total Effect. In both the PSID and the NLS the total effect of waiting one year before having a first child is very small, $16 in the NLS and -$3 in

the PSID for each year a birth is delayed (Tables 8 and 9). This is because the different indirect effects affect later income in opposite directions. The separate positive and negative effects which, when summed, form the total effect are the following.

The Positive Effect Through Education. Compared to a woman of the same age who had a first child, the woman who postpones that child can at age 27 expect to earn $72 more for each year she postpones the birth (NLS). This is because she will obtain a small amount of additional education (about one-fifth of a year), which will increase her own earnings. Since we did not find a direct effect of age at first birth on education in the comparable PSID sample, there is no comparable indirect effect through education in that data set.

The Positive Effect Through Family Size. Because she will have fewer children, she can also expect to work more hours, which is associated with increased earnings at age 27 of $364 for each year she postpones her first birth (NLS). Results are similar in sign, but smaller in the PSID sample. There is a difference in earnings of $58 between women who differ in age at first birth by one year, a difference favoring the older childbearers.

The Positive Effect Through Labor Force Experience. In the PSID we were able to include a measure of work experience, the proportion of years worked since age 18. Among those young women who had their first birth at 19 or older, delaying that birth for one year is associated with increased annual earnings in 1976 of $53, because of the increased work experience they gain. Work experience has been found to be associated with higher wages.

The Negative Effect Through Hours Worked Last Year. However, because she will have worked fewer hours during the last year, at age 27 the woman who postpones a first birth will earn less by $420 than the woman who did not postpone that birth. Results have the same sign but are smaller in the PSID. There is a difference in earnings of $114 between women who differ in

in age at first birth by one year, a difference again favoring the younger childbearers. These results may reflect greater financial need among early childbearers. They do not seem to indicate the presence of a young child since we controlled for the presence of a child under 3 in the NLS and under 6 in the PSID. The results were not affected. However, such later childbearers are likely to be in a different life cycle stage, for which we may not have adequately controlled using the presence of children under 6 or under 3.

Effect on Other Household Income

In the NLS, being one year older at first birth has neither direct nor indirect effects on other household income (whether husband's, other relative's, or non-relative's) at age 27. In the PSID sample, delaying a first birth is associated with decreased other family income in 1976. In this sample a larger family size is associated with larger family income, rather than the reverse. Thus, delaying a first birth, which is associated with reduced family size, is associated with lower other family income. This result is easily explained. Additional analyses indicate a strong association between number of children and number of adults in the household in this subsample. These adults, presumably older children, contribute to family income, since when a control for number of adults is added to the model, the positive direct association between family size and other family income disappears. Therefore, had we controlled for number of adults in the analysis the negative indirect effect of age at first birth on other family income through family size would also disappear.

Effect on Poverty

In the NLS the effect of being one year older at first birth is associated with a reduction in the probability of a woman being in poverty at age 27 of 1.4 percentage points, about 16 percent. Results in the PSID are similar, but reduced in magnitude. A difference in one year of age at first birth is associated with a reduced probability of being in poverty of about half of one percentage point. However, the overall probability of poverty among women who

do not have a first birth until they are 19 or older is low--6 percent. A reduction of half a percentage point is a reduction of 8 percent, approximately half the reduction found among the comparable age group in the NLS. However, in both samples there are offsetting positive and negative effects.

The Negative Effect Through Education. One quarter of the reduction in the probability of being poor at 27 is due to the increased education associated with delaying a first birth in the NLS. There is no indirect effect of a first birth on poverty through education in the PSID.

The Negative Effect Through Number of Children. Half of the indirect effect of age at first birth on the probability of a woman being poor at 27 (NLS) is due to the effect of age at first birth on family size. Being one year older at first birth reduces the proportion in poverty by 1.3 percentage points for every year a first birth is delayed because family size is reduced by about 10 percent. In the PSID being one year older at first birth reduces the proportion in poverty by half a percentage point, because family size is reduced by about 8 percent.

The Negative Effect Through Work Experience. In the NLS there is no measure of total work experience. In the PSID there is a small reduction in the probability of being in poverty in 1976 resulting from the increased work experience gained by women who delay their births one year.

Positive Effect Through Hours Worked. There is a small offsetting effect of being older, however. Because early childbearers appear to work more hours, there is a small increase in the probability of being in poverty at 27 (NLS) and in 1976 (PSID), associated with a later first birth.

The Effect of Age at First Birth in the Total Sample

While we will not detail the results for the sample as a whole, since they are similar to those for the older childbearers (age 19 and older), we will summarize the important points.

Effect on Own Earnings

In both the NLS and PSID samples the effect of an early birth on the woman's own earnings is small (Tables 8 and 9). This may be due more to the intermittent nature of women's labor force participation and to our consequent inability to measure earnings power rather than to a lack of effect. Therefore, consideration of other sources of family income, and total family income, are perhaps more important to our analyses of the effect of early childbearing on a woman's economic well-being.

Effect on Other Household Income

In the NLS we documented a substantial association between delaying a birth and increased household income at 27. However, in the PSID we were unable to find any direct or indirect associations between other family income and the age of a woman at her first birth. This lack of an association is unexpected. On the other hand, what is gratifying and may be more important is that we found very similar associations with whether or not the household income of the family in which the woman lives is above or below the poverty level.

Effect on Poverty

Among the young women in the NLS, a difference in age at first birth of one year is associated with a differential probability of living in a household at age 27 which is poor of 1.6 percentage points, favoring the later childbearers. That is, compared to an average probability of being in poverty of .10, a woman who delays a first birth one year is 16 percent less likely to be living in poverty at 27 than her age peer who does not delay that birth. Among women in the PSID, a difference in age at first birth of one year is associated with a differential probability of living in a household in 1976 which is poor of 1.3 percentage points, favoring the later childbearers.

Compared to an average probability of being in poverty of .13, a woman who delays a first birth one year is 10 percent less likely to be living in poverty in 1976 than her age peer who does not delay that birth.

SUMMARY AND CONCLUSIONS

The overall effect of age at first birth on the earnings of women and others in their households is rather small. This is because the age of a woman at her first birth has both positive and negative effects on later well-being, effects which cancel each other out among women who were 19 or older at first birth. Only among young women who bore their first child before age 18 is there a substantial net effect of age at first birth on the woman's own earnings or those of other family members. Among this group the effect is substantial.

Most effects of age at first birth are clear-cut for school age mothers. Women who bear their first child early in high school are likely to drop out and to have larger families. Lower educational attainment and a larger number of children reduce their own earning power as well as that of husbands or other family members, while greater family size also increases the income needed to stay out of poverty. An exception is the higher other family income of the very youngest mothers.

The effects of a first birth, once a woman has graduated from high school, are somewhat more varied. They depend more on differences in labor force participation and total family size than on differences in years of schooling. Those who have a first birth soon after finishing high school will tend to be less well-off than later childbearers, because they will have larger families and less work experience. However, the earlier childbearers may earn more money because they will be working more hours.

The importance of a woman's childbearing history and earnings as well as the income of other family members to her later well-being is strikingly illustrated by the strong association of an early first birth and poverty. Each year a first birth is delayed reduces the probability of a woman living in a household with a total income below the proverty line at 27 by 16 percent (NLS) and in 1976 by 10 percent (PSID). This is principally because such women will have fewer children, but also because they will obtain more schooling (NLS) and more work experience (PSID), which raise their own earnings and those of other family members.

Even after controlling for the substantial initial differences between girls who have a first birth as teenagers and those who do not, the evidence supports our hypothesis that the age at which a woman has a first birth can contribute or detract from her well-being as a much later stage--at age 27 or older. On the other hand, we did not find evidence that suggests that the process is inevitable. We have attempted to trace this complex process. At each point in the causal chain of events the life course of a woman can be, and often is, altered. An early childbearer who does not quit school and who does not go on to bear a large number of children will not differ much from her age peers who do not have that first birth until they are considerably older. For those young women faced with a birth while still in high school, opportunities to continue in school and limit subsequent childbearing appear to be critical to later well-being.

APPENDIX

Appendix Table 1: Definitions, Means, and Standard Deviations of Variables Used in Path Models (Panel Study of Income Dynamics

Variable	Definition	Age at First Birth ≤ 18		Age at First Birth > 18		Total Sample	
		Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Age at First Birth	Respondent's Age at the Birth of Her First Child	17.04	.96	22.93	3.38	21.75	3.87
Education	Years of Schooling Respondent Completed in 1976	10.66	1.61	12.45	1.99	12.08	2.05
Number of Children	Number of Children Born to or Raised by Respondent	4.14	1.92	2.83	1.62	3.10	1.76
Proportion of Years Worked	Proportion of Years Respondent Worked Since Age 18	.44	.28	.52	.29	.50	.29
Hours Worked Last Year	Total Hours Respondent Worked Last Year	650.52	847.36	898.67	843.39	847.93	845.85
Own Earnings	Respondent's Earnings[a/] Last Year	$ 2,231.40	$3,329.82	$ 3,912.56	$ 4,484.38	$ 3,368.93	$ 4,326.41
Other Family Income	Total Household Income[b/] Minus Respondent's Earnings Last Year	$11,497.17	$6,975.29	$16,873.20	$12,068.07	$15,815.24	$11,390.82
Poverty	Whether or not the total household income of the Respondent falls at or below the level considered adequate size by the Department of Health, Education and Welfare for her household (U.S. Department of Health, Education and Welfare, 1976; Brown, 1976)	.39	.49	.06	.24	.13	.34
Race	Race of Respondent (1 = White, 0 = Black)	.85	.36	.85	.35	.85	.35
Age in 1976	Respondent's Age in 1976 in Years	35.19	6.03	38.54	7.36	37.85	7.24
Parental Socioeconomic Status	An index composed of three variables--occupation of head of household when respondent was 14, mother's education and father's education--standardized to have a mean of 10 and a standard deviation of 3.	9.58	1.67	10.54	3.29	10.36	3.21
Age at First Marriage	Respondent's Age at First Marriage (Never married recoded at mean)	18.73	3.82	20.43	3.65	19.70	2.94
Number of Siblings	Number of Respondent's Brothers and Sisters	3.82	2.66	3.65	2.50	3.45	2.56
Oldest Child	Respondent was Oldest Child (1 = Yes)	.47	.50	.32	.47	.35	.48
Catholic	Religion of Respondent is Catholic (1 = Yes)	.38	.49	.28	.45	.30	.46
Southern Background	Respondent Grew Up in the South (1 = Yes)	.37	.48	.32	.47	.29	.45
Farm Background	Respondent Grew Up on a Farm (1 = Yes)	.20	.40	.20	.40	.20	.40
Timing of First Birth: Premarital	Timing of Respondent's First Birth Relative to First Marriage (1 = Premarital)	.33	.34	.02	.14	.04	.20
Never Married	Respondent Has Never Been Married (1 = Yes)	.02	.13	.000	.09	.01	.10
Currently Married	Respondent is Currently Married, Living With Her Husband (1 = Yes)	.91	.28	.88	.32	.89	.31
Metropolitan Residence	Respondent Lives in a SMSA in 1976 (1 = Yes)	.71	.45	.74	.44	.73	.44
Southern Residence	Respondent Lives in the South in 1976 (1 = Yes)	.29	.45	.29	.45	.29	.45
Physical Limitation	Respondent Has a Physical Problem Limiting Her Activity (1 = Yes)	.08	.27	.08	.27	.08	.27
Husband's Attitude Toward Wife Working	Respondent's Husband Opposes Her Working (1 = Yes, 0 = No, or No Husband)	.21	.41	.26	.44	.25	.43
Student	Respondent is Enrolled in School in 1976 (1 = Yes)	.001	.04	.009	.10	.008	.09
Child Less Than 6	Respondent Has a Child Under 6 in 1976 (1 = Yes)	.48	.50	.28	.45	.32	.47
Months Worked For Present Employer	Months Respondent Worked for Present Employer	19.35	30.71	33.34	53.26	32.07	50.20
Worked Generally at Same Occupation	Respondent Has Generally Worked At The Same Occupation (1 = Yes)	.49	.50	.68	.46	.64	.48
AFDC Benefit Level 1975	Maximum Monthly AFDC Benefit for Family of 4 in State of Residence in 1975	$ 289.00	$95.54	$ 325.13	$ 101.78	$317.74	$101.56
Unemployment Rate	Unemployment Rate in Local Labor Market	.07	.02	.07	.03	.07	.03
Market for Females Vs. Males	Demand for Female Compared With Male Labor in Local Labor Market (1 = Worse)	.27	.44	.31	.46	.30	.46
Foreign-Born Parent	Respondent Has at Least One Foreign-Born Parent	.00	.00	.02	.13	.02	.14

a/ Wages and Salary

b/ Business, interest, dividends, unemployment compensation, wages and salary, other

Appendix Table 2: Definitions, Means, and Standard Deviations of Variables Used in Path Models (National Longitudinal Survey)

Variable	Definitions	Age at First Birth ≤ 18		Age at First Birth >18		Total Sample	
		Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Age at First Birth	Respondent's Age at the Birth of Her First Child	16.98	1.27	21.60	2.26	20.14	2.95
Education	Years of School Respondent Completed At Age 37	11.00	1.55	12.00	1.85	12.08	1.91
Number of Children	Number of Children Born to or Raised by Respondent by Age 37	2.62	1.10	1.88	.84	2.19	1.03
Hours Worked Last Year	Total Hours Respondent Worked Last Year	576.	839.	512.	794.	533.	808.
Own Earnings	Respondent's Earning[a/] Last Year	$1,524.	$2,369.	$1,700.	$2,792.	$1,643.	$2,633.
Other Family Income	Total Household Income[b/] Minus Respondent's Earnings Last Year	$9,380.	$7,698.	$9,276.	$5,589.	$9,310.	$6,333.
Poverty	Whether or not the total household income of the Respondent falls at or below the level considered adequate size by the Department of Health, Education and Welfare for her household (U.S. Department of Health, Education and Welfare, 1976; Brown, 1976)	.33	.33	.09	.29	.10	.31
Race	Race of Respondent (1 = White, 0 = Black)	.87	.34	.92	.28	.90	.30
Age in 1968	Respondent's Age in 1968 in Years	23.50	.50	23.50	.50	23.50	.50
Parental Socioeconomic Status	An Index composed of three variables--occupation of head of household when respondent was 14, mother's education and father's education--standardized to have a mean of 10 and a standard deviation of 3. α = .774.	8.28	2.08	9.69	2.44	9.24	2.42
Age at First Marriage	Respondent's Age at First Marriage (Never married recoded 28)	17.70	2.40	20.60	2.39	19.67	2.75
Number of Siblings	Number of Respondent's Brothers and Sisters	3.21	2.10	2.82	2.22	2.95	2.19
Urban Background	Respondent Lived id a City at age 14	.13	.34	.25	.43	.21	.41
Farm Background	Respondent Lived on a Farm at age 14	.15	.36	.13	.34	.14	.35
Timing of First Birth: Premarital or Ambiguous	Timing of Respondent's Birth Relative to First Marriage	.81	.39	.32	.47	.48	.50
Currently Married	Respondent is Currently Married and Living With Her Husband	.88	.33	.89	.32	.88	.32
Southern Residence	Respondent Lives in the South at age 37	.40	.49	.27	.45	.32	.47
Child Under 6	Respondent Has a Child Under 6 at age 27	.66	.48	.93	.25	.84	.36
Intact Family of Origin	Respondent Lived with Both Natural Parents at Age 14 (1 = Yes)	.81	.39	.92	.27	.89	.31
Home-School Environment	An Index Composed of High School Curriculum (1 = college preparatory), Presence of 3 types of reading material in the home (score 0 to 3), parents' educational goal for the respondent (1 = more than high school), and parent-teacher help and encouragement to continue past high school (score 1 (none) to 9 (a great deal)) standardized to have a mean of 10 and a standard deviation of 3. α = .704.	8.42	1.83	9.74	3.23	9.32	2.28

a/ Wages and Salary

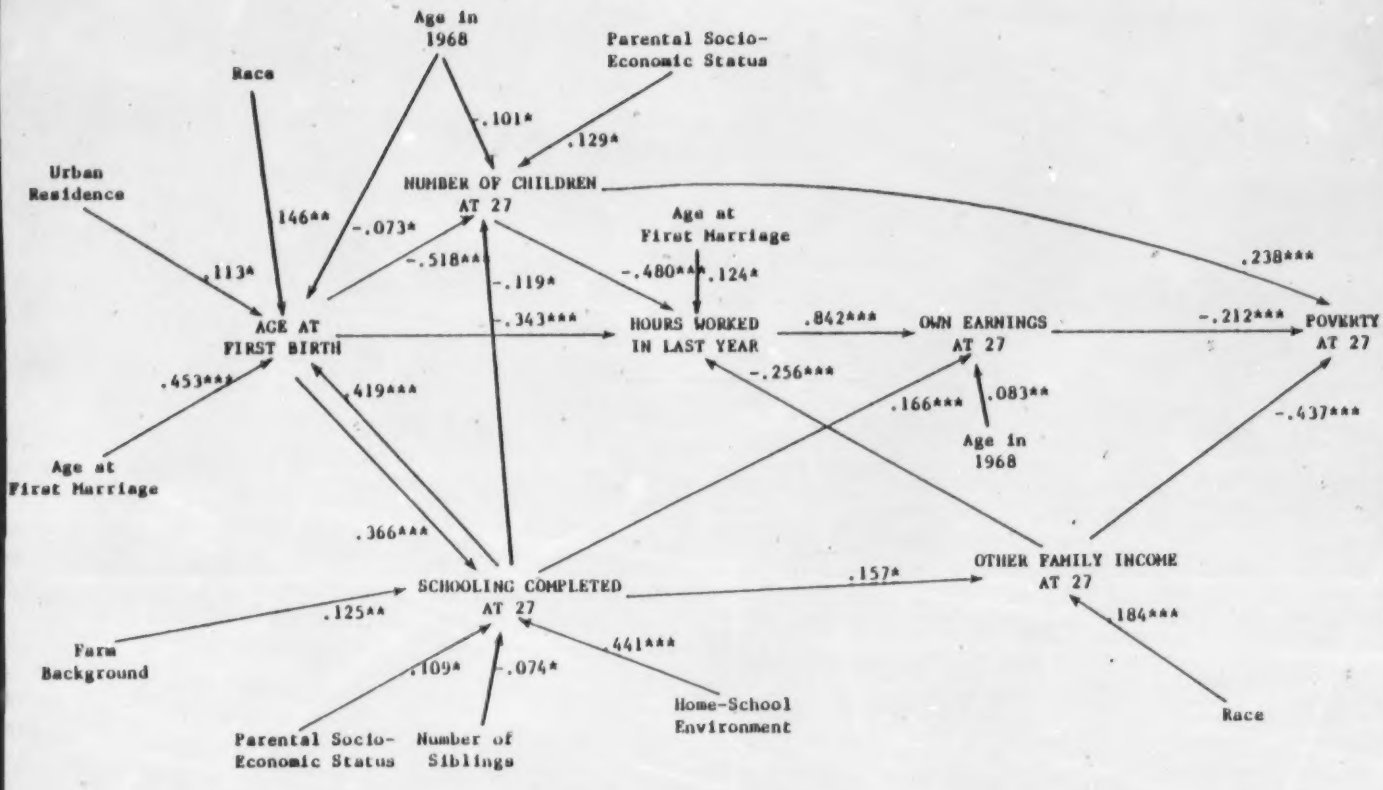
b/ Business, interest, dividends, unemployment compensation, wages and salary, other

Appendix Table 3: OLS/2SLS Estimation of Each Path: Age at First Birth Less than 27 (Total Sample) (National Longitudinal Survey)

Dependent Variable	Southern Residence	Intact Family	Age at Marriage	Urban Background	Farm Background	Number of Siblings	Home-School Environment	Parental Socio-Economic Status	Age in 1968	Race	Age at First Birth	Education at 27	Number of Children at 27	Hours Worked in Last Year	Own Earnings at 27	Other Family Income at 27	Constant	R^2
								STANDARDIZED										
Age at First Birth			.453	.113					-.073	.146		.419						
Education at 27					.124	-.074	.440	.109			.366							
Number of Children at 27						.037		.129	-.101	-.031	-.518	-.119						
Hours Worked Last Year			.124					-.023	-.072	-.006	-.343	.008	-.480			-.256		
Own Earnings at 27	-.029							-.051	.082	-.016	.017	.166	.035	.842		-.024		
Other Family Income at 27	.013							.130	.067	.183	-.043	.157	.064					
Poverty													.238		-.212	-.437		
								METRIC[a]									Constant	R^2
Age at First Birth			.487 (.048)	.816 (.28i)					-.432 (.230)	.144 (.400)		.647 (.098)					11.42	.52
Education at 27					.690 (.215)	-.065 (.035)	.383 (.044)	.086 (.038)			.237 (.045)						3.02	.55
Number of Children at 27						.017 (.023)		.054 (.022)	-.208 (.093)	-.107 (.162)	-.180 (.022	-.064 (.031)					10.98	.36
Hours Worked in Last Year			36.56 (18.31)					-7.73 (19.15)	-117.32 (79.97)	-17.22 140.61	93.97 20.87	3.73 27.05	-378 (47)			-.03 (.006)	5640	.25
Own Earnings at 27	-166 (173)							-55 (38)	436 (157)	-148 (269)	15.24 37.21	228 (53)	92 (103)	2.74 (.109)		-010 (.013)	12,564	.73
Other Family Income at 27	181 (749)							342 (164)	853 (680)	3883 (1150)	-94 (158)	520 (229)	398 (409)				-22751	.10
Poverty													.071 (.014)		-.00002 (.00000)	-.00002 (.00000)	.186	.28

a/ standard errors in parentheses

Appendix Figure 1: Path Model, Age at First Birth Less Than 27 [a/] (National Longitudinal Survey)

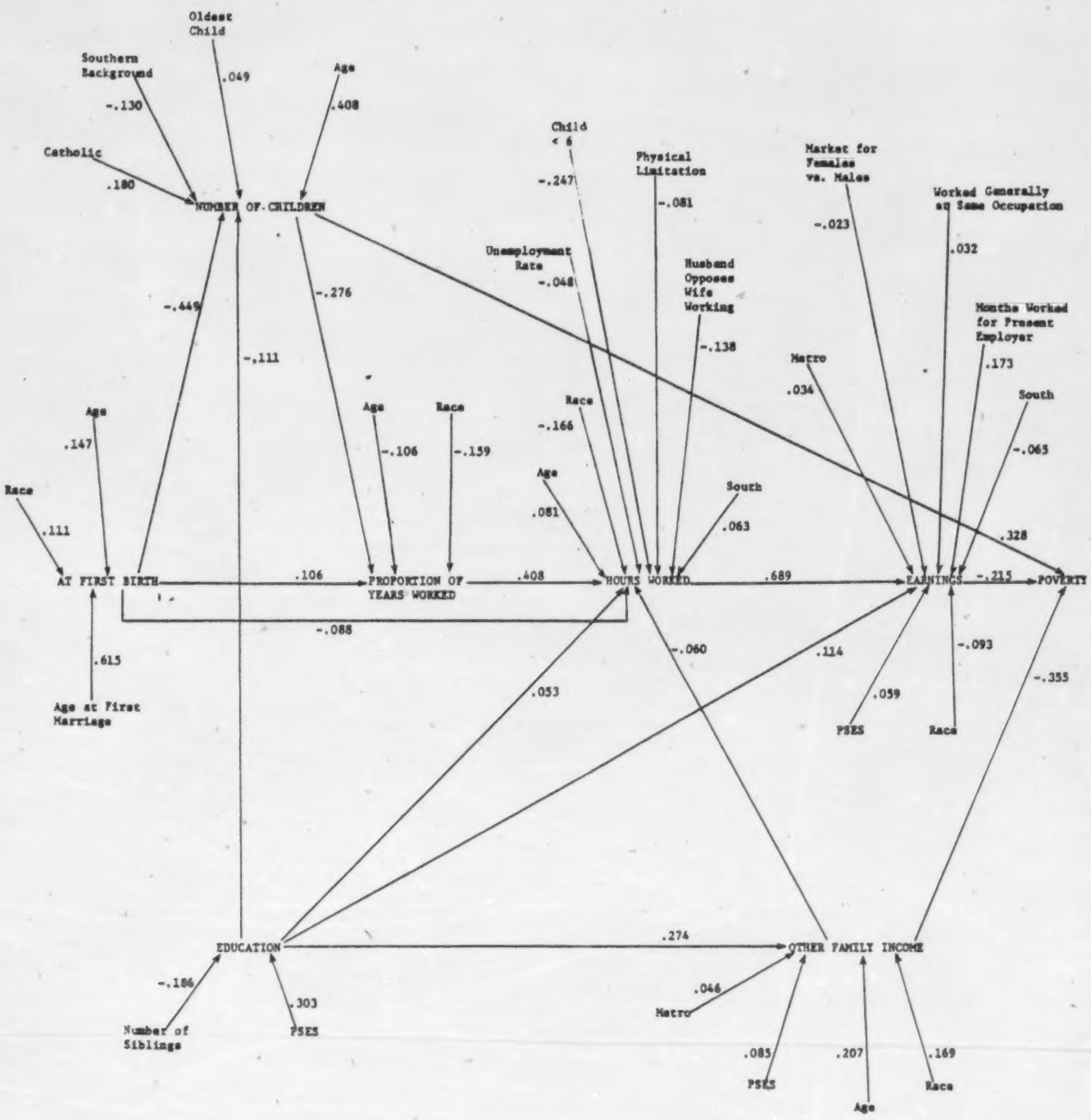


Full sample N = 329

[a/] standardized coefficients

* p < .05
** p < .01
*** p < .001

Appendix Figure 2: Path Model, Total Sample (Panel Study of Income Dynamics)[a/]



[a/] Standardized Coefficients; only those significant at the .05 level or better are presented here.

METHODOLOGICAL APPENDIX

Computation of Paths, An Example Using the NLS

Variables in the Analysis
(National Longitudinal Survey)

X_1 Age at first birth

X_2 Education (years of schooling) at 27

X_3 Number of children at 27

X_4 Hours worked in last year

X_5 Respondent's own earnings at 27

X_6 Other family income at 27 (total family income from all sources minus respondent's earnings)

X_7 Poverty status 1 = less than or equal to poverty level, defined for each year by income and family size (DHEW, 1976)

X_8 Intact family of origin (lived with both natural parents at 14)

X_9 Age at first marriage

X_{10} Age in 1968

X_{11} Parental socio-economic status (a linear combination of mother's education, father's education, and the occupation of household head when R was 14)

X_{12} Race (1 = white)

X_{13} Number of siblings of respondent

X_{14} Home-school environment (a linear combination of high school curriculum, presence of reading materials in the home, parents' educational goals for the respondent, and parent-teacher help and encouragement to continue past high school).

Structural Equations[1/]

(National Longitudinal Survey)

x_1 = "Exogenous"

$x_2 = b_{21}x_1 + u_2$

$x_3 = b_{31}x_1 + b_{32}x_2 + u_3$

$x_4 = b_{41}x_1 + b_{42}x_2 + b_{43}x_3 + b_{46}x_6 + u_4$

$x_5 = b_{51}x_1 + b_{52}x_2 + b_{53}x_3 + b_{54}x_4 + b_{56}x_6 + u_5$

$x_6 = b_{61}x_1 + b_{62}x_2 + b_{63}x_3 + u_6$

$x_7 = b_{73}x_3 + b_{75}x_5 + b_{76}x_6 + u_7$

1/ Simplified to illustrate only the estimation of the effects of age at first birth (x_1) on later variables. Assume all exogenous variables (x_8 through x_{14}) to be contained in "u". Cov ($u_i u_j$) = 0. Refer to Table 4 for complete equations.

Reduced Form Equations

(National Longitudinal Survey)

$$x_1 = \text{"Exogenous"}$$

$$x_2 = b_{21}x_1 + u_2$$

$$x_3 = (b_{32}b_{21} + b_{31})x_1 + v_3$$

$$x_4 = (b_{43}b_{32}b_{21} + b_{43}b_{31} + b_{42}b_{21} + b_{46}b_{61} + b_{46}b_{62}b_{21} + b_{46}b_{63}b_{32}b_{21} + b_{46}b_{63}b_{31} + b_{41})x_1 + v_4$$

$$x_5 = (b_{54}b_{43}b_{32}b_{21} + b_{54}b_{43}b_{31} + b_{54}b_{42}b_{21} + b_{54}b_{46}b_{61} + b_{54}b_{46}b_{62}b_{21} + b_{54}b_{46}b_{63}b_{32}b_{21} + b_{54}b_{46}b_{63}b_{31} + b_{54}b_{41} + b_{52}b_{21} + b_{53}b_{32}b_{21} + b_{53}b_{31} + b_{56}b_{61} + b_{56}b_{62}b_{21} + b_{56}b_{63}b_{32}b_{21} + b_{56}b_{63}b_{31} + b_{51})x_1 + v_5$$

$$x_6 = (b_{61} + b_{62}b_{21} + b_{63}b_{32}b_{21} + b_{63}b_{31})x_1 + v_6$$

$$x_7 = (b_{73}b_{32}b_{21} + b_{73}b_{31} + b_{76}b_{62}b_{21} + b_{75}b_{54}b_{43}b_{32}b_{21} + b_{75}b_{54}b_{43}b_{31} + b_{75}b_{54}b_{46}b_{62}b_{21} + b_{75}b_{54}b_{41} + b_{75}b_{52}b_{21})x_1 + v_7$$

Example: The Calculation of Total and Indirect Effects on Own Earnings (X_5)

1. Start with reduced form equation for X_5

2. For those whose age at first birth is $\leq$ 18:

$b_{31}=b_{41}=b_{42}=b_{51}=b_{52}=b_{53}=b_{61}=b_{63}=b_{56}=b_{64}=0$

3. The only paths that remain, therefore, are

$b_{54}b_{43}b_{32}b_{21}$ and $b_{54}b_{46}b_{62}b_{21}$

4. From Table 4, the metric coefficients are:

$b_{54}=2.18$; $b_{43}=-338$; $b_{32}=-.191$; $b_{21}=.803$; $b_{46}=-.030$; $b_{62}=1123$

5. $b_{54}b_{43}b_{32}b_{21}$ = \$113 (1972 dollars)

and $b_{54}b_{46}b_{62}b_{21}$ = -\$59 (1972 dollars)

\$113 - \$59 = \boxed{\$54} in 1972 dollars

Alternatively, since $b = \frac{\sigma_y}{\sigma_x}$

$$b_{54}b_{43}b_{32}b_{21} = \beta_{54}\beta_{43}\beta_{32}\beta_{21}\frac{\sigma_{x_5}}{\sigma_{x_1}}$$

These effects can be calculated either way.

5. $$\beta_{44}\beta_{43}\beta_{32}\beta_{21}\frac{\sigma_5}{\sigma_1} = \frac{(.808)(-.442)(-.270)(.656)(2270)}{(1.27)} = \$113$$

$$\beta_{54}\beta_{46}\beta_{62}\beta_{21}\frac{\sigma_5}{\sigma_1} = \frac{(.808)(-.275)(.226)(.656)(2270)}{1.27} = -\$59$$

The sum of these effects, \boxed{\$54}, represents the indirect effect of X_1 on X_5 through education as well as the total effect of X_1 on X_5 (1972)dollars)

6. Inflate: \$54 x 1.36 = \boxed{\$73} (1976 dollars)

Example: The calculation of total and indirect effects of age at first birth on other family income (X_6)

1. Start with reduced form equation for X_6

2. For those whose age at first birth is ≤ 18:

$$b_{31}=b_{41}=b_{42}=b_{51}=b_{52}=b_{53}=b_{61}=b_{63}=b_{56}=b_{64} = 0$$

3. The only path that remains, therefore, is $b_{62}b_{21}$

4. From Table 4: $b_{62} = 1123$; $b_{21} = .803$

5. Therefore $b_{62}b_{21}$ = $\boxed{\$902}$ (1972 dollars)

6. Inflate: \$902 x 1.36 = $\boxed{\$1225}$ (1976 dollars)

This represents the indirect effect of X_1 on X_6 through education and the total effect of X_1 on X_6

Alternative Method:

Since $b = \beta \frac{\sigma_y}{\sigma_x}$

$$b_{62}b_{21} = \beta_{62} \frac{\sigma_6}{\cancel{\sigma_2}} \quad \beta_{21} \frac{\cancel{\sigma_2}}{\sigma_1} = \beta_{62}\beta_{21} \frac{\sigma_6}{\sigma_1}$$

4. $\beta_{62} = .226$; $\beta_{21} = .656$; $\sigma_6 = 7699$; $\sigma_1 = 1.27$

5. $\beta_{62}\beta_{21}\frac{\sigma_6}{\sigma_1}$ = $\boxed{\$897}$ (1972 dollars)

6. Inflate: \$897 x 1.36 = $\boxed{\$1220}$ (1976 dollars)

These two result in the same figure, with a discrepancy due to rounding.

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